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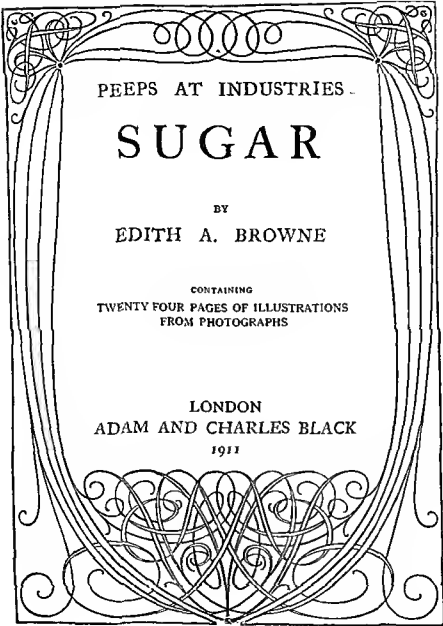
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NOTE

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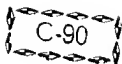
This, the first volume, is devoted to sugar-growing and sugar-making, and the volumes to follow will also be written from first-hand knowledge.

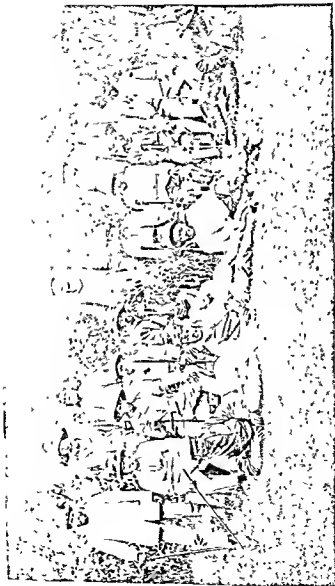
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GIOLI OF BRIVIA'S DEMEL AT A. See p. 28

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SUGAR

CHAPTER I

YOU AND I

I FIND myself confronted with the opportunity of acting as your guide on a trip round and about the Sugar World. I accept the position with a dual sense of responsibility: within the limited time that we have at our disposal for the entire expedition, I must do justice to sugar as absolute monarch of widespread domains; and I must bring you to the journey's end feeling that you have enjoyed to the full every stage of the tour, and have come back with a familiar knowledge of sugar-growing and sugar-making.

You, as I understand you *en masse*, are not a community of embryo specialists in sugar; hence, you are not hoping or expecting that I shall give you such technical instruction in the art of sugar-production as would help you on the road to becoming a successful sugar-planter, sugar-manufacturer, or sugar-refiner. With the majority of you, an interest in sugar springs directly from the fact that you eat it in numerous forms and under various disguises, and like it so much in all its mediums of appeal to your palate that the mere mention of its name gives you a pleasant sensation. Even if you have not a very "sweet tooth,"

you would mourn the limitations that would be put on your daily fare by the total abolition of sugar from universal food-supplies. Indeed, so firm a hold has this commodity taken on popular taste, that its essential quality is symbolic of all things nice, and I venture to believe that there is not one of you for whom the "salt of life" has not a formidable rival in the "sweets of life."

Your interest in sugar has recently been stimulated by various plans and rumours of plans for adding sugar-production to our English industries. Naturally enough, you are now specially anxious to know many things about this industry. But surely there have been previous occasions when, simply as a result of your being intelligent mortals, you have felt a momentary curiosity about the details of sugar-growing and sugar-making, am I not right in my interpretation of the nature of that curiosity, and my conclusion as to why you have never followed it up and found out what you thought you would like to know? Your attitude was, I take it, exactly the same as my own: you did not want to wade laboriously through annual statistics of the Sugar World's output, or to make an exhaustive study of records concerning agricultural and scientific experiments to increase production on certain sugar-growing areas, and of inventions to improve sugar-making machinery. To all such matters you were prepared to give just so much attention as they could reasonably demand from an intellectually alive lay public, but your first and foremost desire was to get into touch with the sugar industry in its natural environment, to see the surroundings in which sugar is grown and made, to know about the people

who devote their workaday lives to its cultivation and manufacture. Why have you never realized that desire? Up to the present moment, I am persuaded that you have been in the same helpless position as I was until quite recently. I could not find anyone who, through the popular medium of a book, had dealt with the sugar industry from a popular standpoint. Consequently, I determined to set forth on a travel-round of various centres of the industry in its many phases, from the cultivation of the raw material to the manufacture of the marketable commodity, with a view to seeing for myself the things I wanted to see, and finding out for myself what I felt I should like to know. Having done this, I now offer myself as your guide on a similar quest.

Briefly to sum up our relationship the one to the other during the whole course of this tour: the majority of you, I take it, have no direct commercial interest in sugar; you are simply and solely pleasure-seekers of general knowledge. And those of you who happen to have a commercial interest in this commodity would like to know something more about sugar than its exchange value and all the problems that affect market prices. It is my aim and object to help all of you to gain an intimate knowledge of sugar-growing and sugar-making by taking you to look at the scenes and scenery amidst which they flourish, and by so leading you into the life of which they are the centre that you may not only get into touch with its stern realities, but feel the fascination of its subtle romance.

By the Sugar World we will understand those districts in which the production of sugar is of intense, oftentimes paramount importance from the commercial

standpoint. This world, whither we are bound, is widespread, covering a vast area and embracing territory in every continent of the globe. To which of its many industrial centres shall we first make our way ?

Seeing that British possessions figure prominently in the Sugar World, shall we not naturally make straight for some British centre of sugar-production ? Let us go to British Guiana, the homeland of Demerara sugar.

It is a fifteen days' voyage from Southampton to this, our only Colony in South America, but we are spending such a festive time on board the Royal Mail Liner which is taking us there, that we have come into the region of the flying-fish and the Southern Cross, and are nearing our destination, before I remind you of the object we have in view. Deck-quoits, athletic sports, cricket and dances on board are all very fascinating, I admit, but we must not forget that eventually we are going to test the enjoyment of our whole expedition to the Sugar World by the amount of pleasure derived directly from seeing sugar grown and made. If you will deliberately turn your back on the ship's alluring attractions, and spare a few minutes to listen to some prosaic facts, I can promise that you will increase your power of appreciating not only Demerara sugar-land, but all sugar-lands. For there are some things which you must know in order to understand what you are going to see, and I am sure you will agree with me that understanding is one source of pleasure. So let us seek a shady spot where we can have a quiet talk

CHAPTER II

LITTLE GRAINS OF SUGAR

SUGAR is hatched from germs which inhabit the sap of certain plants. In the hirth stage it takes the form of tiny grains. I am going to tell you, quite simply and briefly, the way in which the germs become solid little grain-bodies, and in the course of the story I shall answer many of the questions with which you are now bubbling over; sweep away, I hope, most of the difficulties that are now puzzling you.

“Why is some sugar soft like powder, some crystalized, some in the shape of odd-looking lumps, some in smooth-faced, dice-like cubes?”

“And why are some kinds a dark brown colour, others of a pale yellow or golden hue, and others quite white?”

You see, I can quite appreciate and sympathize with your present bewilderment; not very long ago I was feeling in a similar state of chaotic curiosity. But if, in a few minutes' space, I am so to simplify the process of sugar-production that you are fully prepared to enjoy the scenes and scenery of Sugar Land by the time you get amongst them, I must ask you to come to my help. I want you to forget all the questions that are surging in your brain, to make your minds a blank. Good! Now listen to me attentively, with wide-awake interest, and I promise not to tax your patience one whit more than is necessary.

The chief sources of the world's sugar supply are the sugar-cane and the sugar-beet, whose juice is abundantly rich in sugar-germs. These two plant

families are the prime givers of the millions of tons of sugar which are yearly distributed North, South, East, and West, yearly to be devoured in connection with some food or drink by you and me, our friends and our neighbours, and the vast majority of the inhabitants of every quarter of the globe.

Imagine that you are holding in one hand a piece of sugar-cane, and in the other a sugar-beetroot: to look at, the cane is very much like bamboo, with which Japanese occasional tables have made you quite familiar; the beetroot, being white, reminds you more of a parsnip, or of a freak turnip, than of its dark crimson relative which you know so well. In appearance, neither the cane nor the beet gives the slightest suggestion of harbouring moist sugar, crystallized sugar, lump sugar, or any other kind of sugar you have ever seen. Of a truth, they do not contain any sort of sugar in popular, solid form, but in their juice lurk the germs of brown sugar, yellow sugar, or white sugar, soft, granulated, or cube—in a word, of any variety the manufacturer wills to call into being.

Obviously, then, the first step in sugar-making is to extract the juice from the canes and beet.

For this purpose, the canes are crushed in a mill; the juice runs down through the rollers into a trough, and the cane refuse, called "megass," is shot aside to be used for fuel.

The beetroots are shredded, and their juice is extracted by a process which is technically known as "diffusion." In simplest explanation, this is what happens: Hot water is let into a closed vessel which contains a mass of beetroot-shreds, and as a natural consequence—discovered and turned to account by science and the

inventive genius—the beetroot-juice, which is the denser liquid, begins to escape from the plant cells to mix with the water, whilst the water begins to penetrate the cells to mix with their juice. This intercourse goes on until the liquid within the beet-shreds and that in which they are immersed are of equal density, by which time what was originally water is now syrup. This syrup is conducted to a second vessel containing beet-shreds, and the same natural mixing again takes place, the immersion liquid being fortified with a further supply of sugar-juice. Again the immersion liquid is conducted to another vessel containing beet-shreds, and to another, and another, until diffusion practically ceases; the immersion liquid has become as dense and as good in quality as the natural juice of the beet, hence neither wants to commingle with the other. In other words, the hot water put into the first vessel has been gradually changed into beet-juice. Beet-juice, by the way, naturally contains 75 per cent. of water.

From what I have told you thus far about diffusion, you may be thinking there is a great deal of waste in the process. In order to guard against confusing you, I led you to imagine that all the vessels contained freshly-shredded beet; as a matter of fact, no vessel is replenished with a supply of new shreds until all the goodness has left the previous supply, but the only difference this makes to the process, as I have explained it to you, is that immersion liquid circulated through vessels of partly exhausted beet-shreds has to perform a longer journey before it becomes diffusion juice, or pure beet-juice.

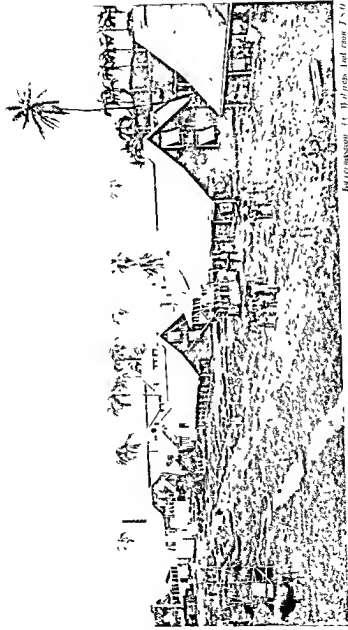
The diffusion juice is drawn off, and at this stage corresponds with the cane-juice extracted by crush-

ing ; the refuse is called " pulp," and is used for cattle food.

Sugar-juice, no matter whether it comes from cane or beet, has next to be cleansed of certain elements which are called " impurities " These so-called impurities are, for the most part, organic elements of the juice other than sugar-germs, amongst them being fermentation germs, which would soon get to work and wreck the formation of sugar ; by the help of milk of lime and carbonic acid a large proportion of alien matter is collected, and the process of clarification is completed by filter process. Before clarification, the sugar-juice is opaque and grey ; afterwards, it is clear and straw-coloured, and although it still contains a certain amount of impurities, there are not enough left to interfere with the birth of the sugar-germs.

Next, the clarified juice, which naturally contains a great deal of water, has to be concentrated. The water is thrown off by evaporation, the juice, under the influence of extreme heat, becoming a thick syrup This syrup is the incubator of the sugar-germs, wherein they are born as tiny grains. The grains are separated from the liquid by a process of draining, or by means of a wonderful machine called a " centrifugal "

The residue liquid is treacle or " molasses." The dry sugar assumes one of three general forms, according to the methods of incubation and separation that are followed (a) It is soft and powdery, consisting of single grains, (b) granulated, consisting of crystallized forms, composed by the union of several grains ; (c) moulded, in slabs of compressed grains, which can be cut up into square or oblong lumps.



Edgewood, the plantation of the late Mr. J. M. Smith

THE LINES, Vol. II, p. 1

Being the quarters provided on a Demerara Sugar Estate for East Indian immigrants

The colour of sugar is determined by its degree of purity, absolutely pure sugar being white, or, strictly speaking, colourless. The sugars made at beet factories and cane mills are, as a rule, grey, brown, or some shade of yellow from pale lemon to bright gold. Those of yellow hue have been sufficiently clarified to be sold for household use; the greys and most of the browns go on to a refinery, where they are melted and subjected to a more rigorous course of purification. Water plays a very active part in the bleaching and refining of sugar; so does the "blue" which your washerwoman uses.

CHAPTER III

A CHAT ABOUT SUGAR-CANE

I HAVE put the cart before the horse by telling you about sugar-making before sugar-growing. But I thought you would be more interested in the cultivation of sugar-giving plants if you first had a general idea of how sugar in its familiar varieties is brought into existence.

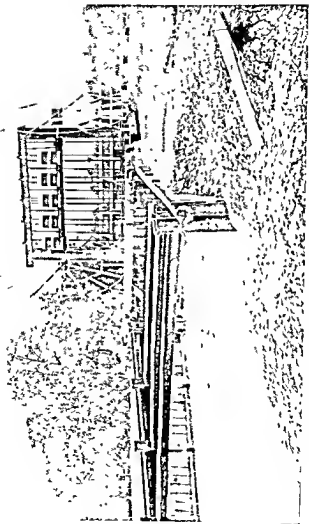
In coming now to sugar-growing, let me remind you that I said a short time ago, "sugar-germs inhabit the sap of certain plants." From such plants I singled out the sugar-cane and the sugar-beet as being the main sources of supply, but before sketching for you the life-story of the two dominant producers, I must point out that there are other plants from which sugar is made. Chief among the minor producers are the sugar-palm tree of India; the sugar-maple tree of America; and an African corn-plant called "sorghum,"

which has been introduced into the United States. We used to import a considerable amount of Indian palm-sugar, known as "Jaggery" or "Gur," but it is now grown chiefly for native consumption; maple-sugar, beloved in its homeland as a dainty, is only produced in comparatively small quantities, and practically the whole supply is reserved for American use; sorghum-sugar is of an inferior quality. None of these sugars is in a position to compete with cane-sugar or beet-sugar, which together rule the world's sugar-markets.

Of the two plants which are the universal suppliers, by far the older is the sugar-cane.

The sugar-cane family is generally believed to be of Eastern origin, although some old writers say that the West Indies and Central America have an equal claim to be regarded as its native land. Nevertheless, most authorities agree that Cochin China, or some near neighbourhood thereto, is its only real homeland, whence it was introduced into China, India and Arabia. During their world-famous period of political supremacy, the Arabs started the cultivation of sugar-cane in all parts of the widespread Mohammedan Empire, including Spain. The Spaniards, in their turn, either transported sugar-cane to the West Indies and Mexico, or, if they found it already growing in the West, they considerably developed its cultivation and taught the natives the art of sugar-making. Experiments have proved that sugar-cane will grow in all tropical and sub-tropical countries; at the present time, there are centres of cultivation in every continent.

Originally, all sugar-canes seem to have been of one



"HOKER," OL. SLICE GAZE, ON A DEMEHARA SUGAR ESTATE. See p. 29

kind, but, for a reason which I will explain to you in a few minutes, there are now numerous varieties of the plant; all the different kinds, however, retain certain family characteristics.

Each cane is composed of root, stalk, leaves, and some species have a head of flowers. The stalk, which harbours the sugar-juice, is ringed with joints at intervals throughout its whole height of from eight to twelve, maybe twenty feet; each joint contains a bud, the germ of a new cane. Luxurious, bladelike leaves spring out at every joint of the stalk, bending at graceful angles under their weight; the topmost leaves cluster into a thick bunch. As the cane ripens, some of the lower leaves fall off, and, in the case of the flowering varieties, out from the sheath aloft shoots an arrow, long and slender, and richly adorned with white or grey feathery heads of countless little silken flowers.

Broadly speaking, the system of sugar-cane cultivation is the same in all parts of the world. Every cane crop not only gives a sugar harvest, but supplies a stock of cuttings for the next season's crop. At harvest close the ground is ploughed or hand-forked, and either furrowed or drilled in rows, from three to six feet apart; plant canes, or cuttings from the tops of ripe canes, are then laid horizontally in the furrows or holes, or thrust in at an angle, a foot or two apart, and lightly buried. The eyes of the buried joints soon begin to spring, and young canes enter on the life of about sixteen months which they require to reach a state of perfection. The roots split up and spread out in all directions to a considerable distance; as it is essential for each division to get a firm grip of the

ground, all the roots must be kept well covered with soil in the early stages of growth.

Besides transferring neighbouring soil to the roots, there is plenty of work to be done in the fields whilst the canes are growing ; indeed, even a moderate-sized plantation, which makes any pretension to up-to-date cultivation, demands the manual labour of a whole army of field-hands, under the supervision of agricultural and scientific experts. There is much weeding to be done, the soil must be nourished with manure, watchful eyes must be on the alert for attacks on the canes by those destructive enemies known as blight.

Moreover, sugar-cane will only thrive under conditions which combine heat, a very considerable amount of moisture, good drainage, and dry ripening and harvest seasons. In sugar-cane lands, dry periods can be relied on, to some appreciable extent, to occur in certain months ; thus, knowing the time necessary for canes to attain maturity, it is possible to fix the planting season so as to prearrange for auspicious ripening and harvest seasons, always providing that the climate does not happen to play pranks. But in those countries where alternate floods and droughts are the order of the year, sugar-planters are confronted with many difficult drainage and irrigation problems, for it is essential that the canes shall have an ample but regular supply of water for many months continuously. Brains must be kept active in devising and improving drainage and irrigation systems, and many hands must constantly be at work cleaning trenches, manipulating pumps, and overhauling sluice-gates.

And there is still one other important operation that must be performed between successive harvests. The full-grown leaves of a sugar-cane field make up a tangle of exuberant, tropical vegetation; a few of them drop off of their own accord as the canes ripen, but the majority retain a tenacious hold of the stalks, and, in commingling, rival the impedimental undergrowth of a tropical forest. Not only are they so thick as to be wellnigh impenetrable, but their edges are sharp as a razor. This tangle of leaves, called "trash," has to be cleared away before the canes can be reaped. Trash is usually cut away by hand, but sometimes it is removed by fire. Forewarned, even, when first you see a cane-field in which the trash is being burned away, you will find it difficult to realize that you are not witnessing a terrible catastrophe. Ferocious tongues of flame lick through the whole field and dart up to the sky, amidst awesome clouds of smoke. Not only does it look as though the whole field would be devoured, but as if the neighbouring fields must surely be devastated; as if, just as surely the catastrophe will reach the proportions of a prairie fire and ravage a myriad acres of sugar plantations. The marvellous fact remains, however that the flames are confined within a stipulated area, and that they devour the trash without actually destroying the canes. It is a matter of dispute as to whether fire damages the crop: some planters maintain that it does not harm the sugar-juice; others are equally certain that the scorching heat is prejudicial even to the canes, which have a very stout coat, and, in consequence, they adhere to the much more arduous method of having the trash removed by hand.

After trash-clearing comes the harvest. The canes are reaped with some form of cutlass; the harvest-makers sever each cane close to the ground, dexterously trim off any odd leaves that may still be clinging to the body of the stalk, and slash off a short piece of the top, from which in turn they sever the head. The long, bare pieces of cane are taken to a mill to be crushed; the decapitated tops, consisting of the upper joints, are kept for planting. The "heads" are used for fodder.

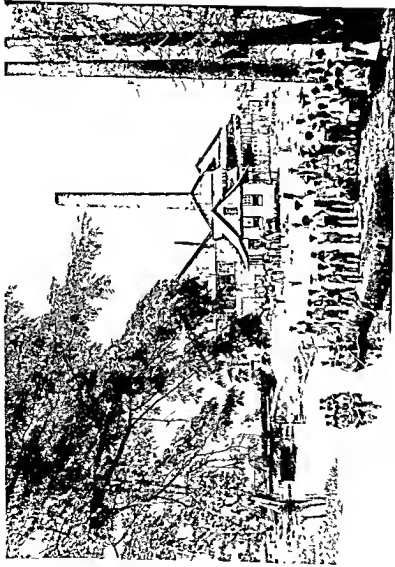
CHAPTER IV

A CHAT ABOUT SUGAR-CANE—*continued*

ALTHOUGH the system of cane cultivation is the same throughout the Sugar World, numerous and widely different practices are followed in regard to details. Some such differences are matters of custom, others are the natural result of local conditions.

For instance, I said the top joints of canes were cut off and kept for planting; as a rule, the tops only are used for this purpose, being specially selected as the nucleus of a new crop on account of their comparative softness and readiness to send forth young shoots. But in some countries the whole length of ripe canes is used for cuttings.

Again, as a general rule a new crop is raised from cuttings, but successive crops are sometimes grown from one batch of roots. If the old roots are allowed to remain in the ground after harvest, shoots spring from each "stool" or cluster. These shoots produce a fresh growth of canes, called "ratoons," which



J. H. & George, Jr. George town

SATURDAY AFTERNOON SCENE ON A BIRMINGHAM NUCLEAR PLANT. See p. 45

A gang of plantation workers awaiting the call to the pay-office

mature in about twelve months. Ratoon-crops are not usually so luxuriant as those raised from plant canes. The possibility of cultivating them with any success depends largely upon the fertility of the soil.

And yet another striking difference; in some centres the old-fashioned methods of hand forking and weeding are favoured, whilst in other more advanced districts labour-saving agricultural implements are used.

A reliable guide as to the importance in local eyes of the local cane industry in particular, and the whole cane industry in general, is the amount of attention given to manuring.

And a very sure sign of progress is shown by the existence of Government Nurseries and Laboratories, where experiments are carried on in the interests of sugar-production in a particular country and its various localities. Amongst the most important experiments are those which aim at discovering the special varieties of cane that are most likely to thrive under local conditions, and those which have for object the breeding of new varieties from seeds.

Sugar-cane seeds abound in the clusters of tiny flowers that appear when the canes arrow. What a motley crop the planter would have if he sowed his plantation with them; no two can be relied on to produce the same kind of plant.

By being taken to different countries, and brought up in different ways, members of the sugar-cane family have acquired peculiar habits of their own, and developed individual traits. For instance, some sugar-canes are of medium height and girth, others short and slim, tall and slim, tall and fat. They all make a brilliant colour display with their stalks, but whilst

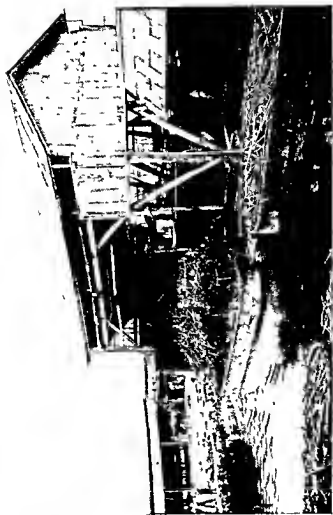
some favour a coat striped in orange and purple, others prefer scarlet flecked with blue, an artistic mixture of greens, barbaric splashes of indigo and vermillion, or a patchwork of sunset hues. Another, and vital, difference in the canes is the varying amount of juice they contain, and the varying quantity and quality of sugar which that juice will yield.

Plant canes can be relied on to follow the habits of their parent, but seedlings are perverse and self-willed. The majority of seeds from one cane will more often than not produce throw-backs, akin to remote ancestors, or a new variety. The self-willed seedlings are aptly called "sports." Sports are great favourites in the Experimental Nurseries. They shed much light on the sugar-cane family as a whole, and offer many valuable suggestions as to the most skilful, scientific, and profitable ways of cultivating a sugar-cane plantation. A specimen collection of bits of sport canes is reminiscent of a gaily variegated hundle of Christmas crackers.

CHAPTER V

A CHAT ABOUT BEET-SUGAR

THE sugar-beetroot grows in temperate regions. To-day its chief centres of cultivation include almost every European country and the United States. England has recently shown a keen desire to produce the plant on a large scale, and it is hoped that she will soon be taking a prominent position not only as a sugar-beet farmer, but as a beet-sugar manufacturer. Up to now the part played by the British Isles in



LOADING CANIS AT THE MILL, DENVER, 1900

sugar-production has been limited to refining, England and Scotland both having won renown as being among the leading refiners of the world's sugar-supply.

The birth and growth of the beet-sugar industry make very modern history in comparison with the career of cane-sugar. Native Chinese and Indians were sucking the juice out of hits of sugar-cane in the very long-ago days ; and as early as the sixth century both India and China were turning cane-juice into sugar, India having made such progress with the industry that she was then carrying on an export trade with Europe in a white variety.

But it was not until the middle of the eighteenth century that beetroot-juice was found to be particularly rich in sugar-germs. The discovery was made by a German chemist, and it was one of his compatriots who, towards the close of the century, invented the first practical method of extracting beet-juice. In view of the very old example set by the cane-sugar industry, it is not surprising that this invention embodied a crushing process ; the roots were reduced to pulp by a machine, and the pulp was wrapped in cloths and carried on trays to be squeezed in hydraulic presses. The simpler and more economical diffusion process of extraction was not adopted till 1860 ; the pioneer of this new method was an Austrian sugar-manufacturer, who laid the whole beet-sugar industry under an inestimable debt to his genius and enterprise.

To go back to the infancy of this industry : remember, they were two Germans who first discovered that sugar could be made from beet-juice, and that there was a way of making it which gave promise of creating a profitable new industry. To the credit of Germany,

you should take note that the first beetroot-sugar factories were erected in the Fatherland.

France was quick to recognize the possibilities of a venture which held forth bright prospects to both the agricultural and manufacturing classes and masses. She threw her commercial heart and soul into the business of founding a rival branch of beet-sugar production, and, as luck would have it, that rival branch was soon being fostered by strong political support. The master-mind of Napoleon was just then bent on ruining British commerce. In 1806 the powerful Emperor had ordered Europe to suspend trade relations with the British Isles, in 1807 he had resorted to the extreme measure of singling out as contraband every ship, no matter what its nationality, which touched at any port of Britain or of a British Colony. British Colonies, notably the West Indies, were at this time prominent among the leading producers of the world's sugar—cane-sugar, of course, for the beet-sugar industry was in its infancy. The Napoleonic blockade naturally sent the price of sugar up to famine rates in Europe, and fortunes seemed to be awaiting men who could produce a homeland supply, from the newly discovered beetroot source, to make up to some extent for the lack of imported cane-sugar. In their zealous pursuit of the new industry the French had much direct support from Napoleon, in addition to the encouragement derived from his policy of blockade. He voted considerable sums from the National Exchequer to foster beet-sugar production, and made extensive grants of land for sugar-beet cultivation and the erection of factories. As a result of French commercial enterprise, backed by political support, by

1812 France had forty beet-sugar factories at work, which made her a formidable rival to Germany, the homeland of the industry.

When the Napoleonic blockade was raised, the price of sugar naturally went down, and, just as naturally, the youthful beet-sugar industry found it very hard to compete with the old-established cane-sugar industry. Gradually, however, the new industry was nursed into such a vigorous condition that it became a most threatening rival to the older one. Other European countries followed the lead of Germany and France, and their various Governments came to the assistance of the farmers and manufacturers. Eventually, at the close of the nineteenth century, there existed a State-aided, European beet-sugar industry, which had fair to ruin the whole world's ancient and widespread cane-sugar industry.

By this time, however, the European Governments had begun to wake up to the fact that beet-sugar had now attained such a vigorous hold on commercial life that it could very well fight for itself; and to realize the still more important fact that they had been helping a minority of farmers and manufacturers to grow rich at the expense of the community. Also, by this time, there was a general outcry from sugar-cane planters against the unfair methods of competition resorted to by their rivals. And on both sides, politicians interested in economics and the welfare of the community were agitating for reform.

The general discontent led to an International Conference on the sugar question, in 1903. At this meeting, historically known as the Brussels Convention, fair-play terms of competition were arranged, and the

two industries were henceforth to fight for supremacy on their own merits.

Since I do not wish you to think I have been influenced by any political bias whilst outlining the history of beet-sugar, I should like specially to point out to you some of the benefits derived by the cane-sugar industry from its tough struggle for life.

The beet-sugar producers have always shown themselves keenly alive to the necessity of keeping up to date in the pursuit of agriculture and manufacture. And if their respective Governments' methods of rendering them assistance are open to criticism, at least it must be admitted that the giving of help bore witness to national interest in national industries. On the other hand, the cane-sugar producers, for the most part, were content to jog along as their ancestors for many generations had done before them; they did not see the force of laying money "dead" in improvements. And there was little or no national interest in their industry to spur them on.

Largely owing to the fight put up by beet-sugar, there has been a complete revolution in the methods of conducting the cane-sugar industry. Planters now devote their attention to the latest scientific methods of cultivation, up-to-date estates have a resident chemist, who gives advice on such matters as artificial manuring, tests the quality of the sugar-juice, and looks after the boiling at the all-important birth stage of the grains, factories are fitted with the latest improvements in sugar-making machinery. And national interest in the industry is shown by the attention given it by Boards of Agriculture, and by Government Experimental Nurseries and Laboratories.

“Which is the better sugar,” you are wondering, “cane or beet?” “And which industry is now likely to become supreme?”

The first question I put to two experts in turn, the one a Professor who has the interests of the cane-sugar industry close at heart, the other an equally eminent devotee of its rival. From both I received the same answer, which amounts to this: Cane-sugar and beet-sugar are equally good; the impurities of sugar-cane juice have a pleasant taste and smell, whilst those of beet-juice are unpleasant, but when the sugars have been refined, not one person in a million can tell which is which. Since then, I have asked several lay-folk if they have any preference for either of the two general makes, and in every case but one the experts' statements were endorsed by public opinion. The exception, a housewife, assured me that preserves keep better when they are made with cane-sugar.

As to which industry is likely to attain a lasting supremacy in the world's sugar-markets, I do not think there is a single authority who would venture to voice a prophecy. Even under fair-play conditions, there are so many details to influence the fighting power of the rivals, as you will see for yourselves when we go over cane plantations, beetroot farms, mills and factories.

Is there any reason why you should take sides in the fight?

A little time ago it might have been argued that as Imperialists you should patronize cane-sugar, because our Colonies play such an important part in the industry. Now that England is going into the beet-sugar industry, it looks as if Patriotism were going to

call on you to favour beet-sugar. It is no business of mine what sort of sugar you use. I have only come with you as guide to the Sugar World and showman of its life. Any serious, underlying idea I may have in taking up this position will be fully realized if you remember, whenever you see sugar or consume it, that sugar-production is one of the most important of our British Imperial industries.

CHAPTER VI

A CHAT ABOUT SUGAR-BEET

THE rival sugar crops belong to such very different plant families that the methods of rearing them are different in many respects, as also are the ways of gathering in the harvest.

Sugar-beetroots are raised from seeds. Among the untiring efforts that have been made to bring the beet-sugar industry to a high standard of efficiency, the care and attention given to the seed department conspicuously point to zealous pursuit of progressive ideals. The better the seed, the richer the quality and quantity of sugar-juice in the roots. The yield has already been trebled through the agency of the seed nurseries.

You will realize the importance of this increased power of production when I tell you that a field of sugar-cane naturally gives a very considerably larger amount of sugar-juice than does a field of sugar-beet of similar size. But so great has been the stimulus given to beetroots by selecting the very best seed from which

to raise the crops that the difference I have mentioned has been materially decreased. So much so, that cane growers have seen the wisdom of taking precautions against losing one of their most effective fighting forces—the advantage of a bigger supply of sugar-juice from every acre under cultivation. To maintain that advantage, in the face of such threatening efforts of the beetroot-seed nurserymen to deprive them of it, they have set about the work of discovering, by selection and breeding, canes that will yield the best quality juice in maximum quantities, under every condition of soil and climate. In a word, the experiments with seedling canes, which I have told you about, have been largely inspired by the success attending the establishment of seed nurseries in connection with the cultivation of sugar-beet.

The beetroot plant flowers and seeds between the age of one and two years. The very best roots are selected for the nurseries, whence, directly or indirectly, all the farmers obtain their seeds. Germany and France are specially famous for their sugar-beet nurseries, and the other European countries frequently buy seeds from them.

Generally speaking, the system of sugar-beet cultivation is the same in all lands where the plant is grown.

The ground is well broken up, thoroughly cleaned and manured. The seeds are sown in the early spring, and they very quickly sprout into young plants. The plants are "married" as they are born, according to the vernacular of the industry; for one of the earliest operations in the fields is known as "demarriage." The business of unmarrying the infantile seedlings is

simply what you and I would call "thinning out"; this work is all done by hand, and many children are to be seen among the labourers who go round the fields on their knees at demarriage season.

It is particularly necessary for the little plants to be kept clear of weeds, so hoeing keeps the farm-hands very busy. And, as a rule, the crops are given a feed of artificial manure. But the beetroot fields have only to be tended a very short time, in comparison with the long succession of months during which sugar-cane fields have to be looked after; about four months after the seeds are planted, the crop is ready for harvest. The roots are levered out with a spade, or with a queer-looking kind of fork, which has ball ends to the prongs—the ordinary, sharp ends might easily pierce the roots and make them "bleed."

The sowing and harvest seasons vary in different countries, according to the general date limits of the frost season. The seeds are put in as early as possible after Jack Frost can reasonably be expected to have taken his annual leave; but the young plants must not be exposed to any risk of a late, flying visit from him. The harvest must be gathered in before he is expected back, for the roots could not be dug up when the ground is in his clutches. But as the sugar-beet growing districts are all confined within narrow limits of latitude, there is very little difference in the dates which mark the beginning and the ending of the crops' existence. Generally speaking, May is the planting month, and harvest-time comes between the end of September and the middle of November. How different with the cane crops, which are located throughout the world, between wide margins of lati-



E. W. Sotory

tude. At all times of the year there is a sugar-cane harvest being gathered in somewhere.

I hope I have now silenced the most tiresome questions that were worrying you when we started our journey. No, possibly there is one other thing that many of you would particularly like to ask me. What does a field of sugar-beet look like? Of a truth, in itself it makes a very poor show in comparison with a field of stately sugar-canes; the crop is under the ground, you know, and all you can see is a dwarf array of leaves. You might very well be looking at a field of mangel-wurzels. But the labourers, in their various peasant costumes, dot the sugar-beet farms with quaint and pretty pictures, which are vivid with colour. And there is much that is entertaining in the scenes provided by the factories, whilst some of the most beautiful European scenery forms a setting to the industry.

But for the present, we must think no more of beet-root sugar. We are about to land in Demerara, which gives its name to the cane-sugar you have all known and loved from childhood days.

CHAPTER VII

DEMERARA SUGAR AT HOME

WE have set foot on British Imperial soil, in a north-eastern corner of South America. We are in the country called British Guiana, the little land which constitutes our only Colony in a vast Republican stronghold. Through stories of such famous republics

as Brazil, the Argentine, and Venezuela, and of their mighty rivers, the Amazon, the La Plata, and the Orinoco, you have, I expect, become fairly familiar with the power and glory of South America. But how many of you had even heard of British Guiana before we started forth on our journey here? How many of you, knowing it by name, could have said offhand where it is situated? Yet this least known of all our Colonies, this Imperial Atom of a great Republican Continent, can call to life for us all the dreams which have ever haunted our imagination when we have heard the magic name of South America. And it is this Nature-enchanted little Colony which is the homeland of Demerara sugar.

The sugar is all grown and made within a narrow coastland strip, which has been called to a state of civilization entirely by the industry. A large proportion of the sugar-producing area is situated in the province of Demerara, which has thereby given its name to the Colony's special make of golden crystals. Bounding the sugar-industrial strip on the one side is the sea; inland, the confines are marked by an irregular curve formed by the margin of unreclaimed forests.

Let me try to focus this setting for you, and imbue it with life. Demerara sugar-land is very flat, and at high-water times the sea is above the land-level. As a protection against floods a margin of primeval Bush was left along the coast in parts where forests were cleared for sugar cultivation. The very low-lying grassy shores, which occur in patches between the Bush-border, are dotted with pumping-houses, which are fitted with powerful drainage machinery. The



coast traffic consists largely of barges devoted to the sugar industry, which, manned by a darkie crew, ply between the plantations and Georgetown, the capital of British Guiana and central distributing port of the Colony. But the most fascinating part of the whole exterior setting is the background of forests. On this present expedition of ours, I should be leading you astray if I took you for the ideal trip which it was my own good fortune to make into the wilds of British Guiana ; still, I feel justified in giving you a peep at those forests, for a mere glance will help you to understand how much hard work and enterprise have gone to the redemption of a homeland for the Demerara sugar industry in this gorgeous wilderness of a country. Three broad rivers penetrate the wilderness, but their *course is frequently blocked by turbulent rapids and unnavigable falls*. Here and there paths have been cleared in the jungle by cutlass and axe ; but, for the most part, the forests are a seemingly boundless, impenetrable expanse of giant trees, which rise from a dense tangle of undergrowth, only to be knotted together again by thick masses of creepers, and by stout Bush-cables and ropes. These background wilds of sugar-land are the home of orchids, of other delicately wrought blooms which are equally fantastic in shape, of a wealth of vivid-hued flowers, of birds of brilliant plumage, such as parrots and macaws, and of aboriginal Indians. In a word, they are closely akin to the world-famous forests of the Amazon, to which they are near neighbours ; and there is little doubt that when they are better known they will be equally renowned for their wealth and beauty.

I hope you have been able to picture the surroundings

to the cradle of the Demerara sugar industry. Now I want to give you a first peep at the little strip of British Guiana which is devoted to sugar-growing and sugar-making

We have landed in Georgetown, and here at once you begin to scent the atmosphere of the cane district. True, Georgetown is an up-to-date city, whereas the cane-fields constitute a region which has a distinctly country aspect and atmosphere. Nevertheless, you notice at once that the capital has a very cosmopolitan population; and you are particularly struck by the number of East Indians you see in the streets. Coolies, as these folk are called, form the main part of the labouring population of the sugar estates. Blacks, who, as you see, are also prominent among the inhabitants of the capital, sometimes work as field-hands, but their position on the estates is more often that of factory hand, or of driver—an under-foreman who looks after a gang of labourers, and one of whose chief duties is to see that all his charges go to work. Some of the higher positions, too, are filled by natives. As you are in the capital of a British Colony, naturally you are not surprised to find some white people here; you may also rely on meeting a few of your countrymen on the sugar estates, where they fill such responsible offices as those of planter, manager, engineer, chemist, and overseer.

Many of the estates are quite close to Georgetown. Some, as I have told you, are on the coast; others border the lower course of the Demerara River. Here is a bird's-eye view of one of them, chosen at random.

An oblong expanse of land has one of its narrow sides fronting the natural waterway; this low-lying land

has been empoldered, being protected against floods by dams, main drainage trenches with sluice-gates, and a river or sea margin of Bush left, as I have explained, when the clearing was made. The main drainage trenches, with their sluice-gates connecting with the water frontage, can also be used, if necessary, for irrigation purposes. Lengthways down the middle of the estate runs a broad walk, on either side of which are navigation canals. From this central walk as base, the estate is laid out in rectangles, completed by cross-navigation canals as side boundaries. The cane-fields occupy the rectangular enclosures, and are further divided into sections by drainage ditches.

The chief buildings on an estate are the factory—known as the mill—the manager's house, the overseers' quarters, a hospital, a school, and a store, usually kept by a John Chinaman. The hospital and school are compulsory institutions in the case of all estates which employ indentured coolie labour. The Colony brings over the coolie immigrants, the planters paying part of the expense involved; in return, the coolies are attached to an estate for five years, the Government being responsible for their welfare. The system of indentured labour is very much like that of apprenticeship. These apprentices have to live on the estates and do the work they undertake; they are paid for that work, and apart from the restrictions mentioned, they are free agents. In completing their apprenticeship they cancel all obligations to their employer and to the Colony.

Let us make a short journey to one of the Demerara sugar estates, in the near neighbourhood of Georgetown. Here, before taking you among the canes, I

will show you the school, because I am sure you will find the scene within particularly entertaining.

The schoolhouse is a wooden building of one story, specially designed to be a cool and shady retreat ; it has a gallery approach, and the space within the doorway is given up to one room, which has jalousies for windows. In this room you find the quaintest collection of copper-coloured girls and boys, of all ages and sizes. They all have bare legs and arms, and seem but half clad, but since you are so very hot, even in those light clothes specially chosen for the tropics, you feel inclined to envy them their *fashion of scant attire*. Standing in the midst of this assembly, do you not feel that you are an onlooker at a Juvenile Fancy Dress Fair ? The schoolmistress is a Black, albeit a British subject like yourself ; close under her wing are her two picaninies, who look very smart in European costume, and answer to the very English names of John and Maria. But can you imagine any more appropriate names than those to which her coolie pupils answer—for instance, Pancheoo, Baldeo, Buddho, Chowa, Dookawah, Gangee, Jumney, Ruggoomunden, and Tulsi Singh. No wonder your eyes roam from coolie girls to coolie boys, and hack again through the crowd picking out boys from girls ; it certainly is difficult to make up one's mind which sex as a whole presents the weirder appearance. However, apart from numerous variations in the colour of their garments, I expect you have already noticed that all the boys seem, with one accord, to have agreed to wear nothing but a short cotton shirt, and silver bracelets on their wrists ; that the girls have rings in their noses, bangles on their ankles, a bright kerchief headgear, a cotton skirt to



Mrs F White

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the knees, a gay holero—which, by the way, is called a “juila”—and between the body garments a couple of inches of bare flesh, as natural waistband.

Drilling, reading, and reciting tables all seem part of the fun of the fair to you; as a matter of fact, this picturesque little crowd is doing its best, and quite a good best too, to show what little East Indians can learn, even in a foreign school; what they can be taught, even in a foreign language.

Singing is a great favourite among lessons, judged by the enthusiastic and whole-hearted way in which they give a sample performance, for your benefit, of

“ I have got a fiddle,
It is nice to see;
Strings around the muddle.
Father gave it me.”

The children only have to attend school in the morning; in the afternoon they go to work in the cane-fields.

CHAPTER VIII

A TRIP “ABACK”

I AM going to take you “aback.”

No, I am not indulging in the slang expression for a surprise in store, although, as a matter of fact, you will see much that will both amuse and astonish you. “Aback” is plantation lingo for the cane-growing lands which lie to the rear of the mill and official residential quarters.

I am only going to give you a peep at a small estate, covering about two thousand acres, and employing

eight or nine hundred hands ; small, that is to say, in comparison with some of its neighbours, one of which embraces ten thousand acres, and has a staff numbering fully eight thousand men, women and children.

But the size of an estate makes little or no difference to the out-of-door plantation work in Demerara, and in this scorching sun you will not want to make a very long trip, seeing that a short one will serve our purpose equally well. In the case of the mills, however, size is apt to affect working methods, so when I want to show you how Demerara sugar is made, I shall take you to the biggest mill in the Colony, where you can see the latest improvements for extracting the juice from canes, and turning it into crystals.

By kind permission of the manager, we step into the little Noah's Ark which is kept at a landing-stage near his house, to be used by himself and his overseers for daily tours of inspection. Our craft was designed for hard wear and tear, and makes no pretension at being either beautiful or comfortable. Her coat of paint is of serviceable grey hue ; canvas sugar-bags do duty as carpets and seat coverings ; and fitted to the hut amidships are sun-bleached, shower-mottled blinds, haunted by ghostly stripes. It is a mere accident of taste that the little boat's quaint form and appearance have a decided charm for us.

As we take our seats within the hut, a black boy and a coolee lad attach a mule to the boat by a long chain , a moment later, the darkie deftly jumps astride the rudder, and the coolee flicks his whip. A lengthy interval elapses, in which we wait the mule's pleasure to step forth and tow us along. At last we are under way Your eyes wander from left to right, from right



FUNT UNDEI SUGAI BAG CANVAS, DENEI AIA See p 43



PEAFING SIGAF CANE, DENEIARA See p 43

to left, watching the panorama that is gliding past. A stretch of green grass, whereon cows and sheep are contentedly grazing, carries you back to English meadowlands in the Fen District ; a moment later comes an expanse of virgin Bush, thick set with scrub and trees that are knotted into an impenetrable tangle by endless twistings and turnings of gaily flowering creepers ; next pass in broken procession stately palms waving their feathers aloft in the gentle breeze, clusters of wild bananas, arrays of strange shrubs, displays of strange fruit, and patches of barren wastes ; and through all the scenes, ever and anon flit birds of brilliant plumage, and mammoth butterflies whose gorgeous wings have been steeped in the magic colours of the tropical wilds.

As we near a primitive wooden bridge, the mule is unhitched, and by the help of the hank the helmsman steers us under the rafters and sharp round a corner. The while the heastie is being relinked to the hoat, we scramble on to the roof of the hut, from which vantage-ground we can get a wide view of our surroundings.

We are now in the right of the plantation's two main navigation trenches, which run parallel, but are separated by a broad tow-path. We have struck the cane-lands. As far as the eye can reach to take a sweeping glance over the low-lying landscape, lo and behold there is an arena which seems entirely given up to a magnificent show of green leaves. But knowing what you already do about sugar-canes, your imagination quickly transforms this restful-hued but deserted-looking panorama into a scene richly endowed with colour, and permeated with the drowsy hum of life. Look at the standard canes close at hand, alongside the dam ; their decorative staffs are plainly visible

among the streamer leaves thereon, and immediately they make you realize that there are thousands upon thousands of multi-coloured stalks concealed in the great, green beyond. And, see, a yard or two ahead of you there is a brown figure slowly rising from the dark depths of the earth, as it would seem, to stand in the shadow of a cane-bower, with little sunbeams darting around him like fireflies. The sudden appearance of this man, cutlass in hand, reminds you that there is work to be done on a sugar plantation, that this very estate employs several hundred field-bands, men, women and children. The majority of them are on duty to-day, but they are bidden away among the canes. Many of them we shall discover when, presently, we land and take a walk through the fields.

We have been towed along for a good quarter of a mile without coming across another sign of life. Having grown accustomed to the solitary aspect of our surroundings, we again experience a shock of surprise on seeing a coolie girl break through the canes; but this little disturbance of our equilibrium is a mere nothing compared to the astonishment that takes possession of us as we watch that girl step straight off the dam into the water—with her clothes on. She wades, neck-deep, through our navigation canal, hauls herself up on to the tow-path, shakes herself, crosses to the companion canal, and wades through that. On the opposite bank she slips off her short, jumper bodice, wrings it out, draws it over her head again, and plunging into the canes, is lost to view. She has simply been following the usual method of transit by which the labourers cross the waterways between the fields.

CHAPTER IX

A TRIP "ABACK"—*continued*

FIVE minutes more in which there is no figure to be seen on the landscape. Now, riding towards you along the tow-path comes a man on mule-back. He is a white overseer, who, upon coming up with us, gives us greeting and dismounts. He has come to meet us, and conduct us through some of the cane-fields

Why do you look so surprised as you cover him with a swift glance from top to toe? You expected to see him arrayed in the full uniform of what you call Bush Kit? I assure you he is so dressed. Speckless brown boots, elegant puttees, brand-new khaki riding-breeches, and all the other magnificent *etceteras* of a plantation overseer on the stage, or in a novel, are not for workaday life. Ask of any man who knows about such things from personal experience what is the best style of costume to wear for plantation-work, and his reply will almost invariably be: "Any old thing is good enough."

Hence, you need not be at all surprised to find our new friend in a very old suit, the coat sagging from the effects of many a tropical drenching, the trousers tucked into ancient leggings, and his kit completed by navy's boots and a weather-beaten wideawake

We step out of the boat on to the dam, and the overseer prepares to join us. He gets into a tiny, flat-bottomed boat, known as a "floater," in which there is just room for him to stand up, and his little black-boy attendant jumps into the trench and pushes him across.

Let me give you a few hints before you follow our leader in this expedition among the fields. Mind how you push the canes asunder to get through, for the leaves have edges that cut like a razor. Keep your gloves on, if you can endure the heat of them. But at any cost to your hands, you must guard your face, especially your eyes, and you must be prepared to find this a difficult task when you are among the fields of full-grown canes. And do not jump in regulation good form, so as to come down on both feet at once; the slimy banks of the drainage trenches, which you will have to clear, are very slippery, and if both feet come down together and do not get a good grip, you are more than likely to fall back into the muddy water. Whereas, if you give yourself two chances of a foothold, and lose one, you may still manage to shuffle into safety. The navigation canals you will have to cross, to get from field to field, are too wide to jump. Each of you will go across separately in a floater; be very careful to keep your balance, particularly at the moments when it is shoved off, and when it bumps against the opposite shore.

As we follow our guide, we see canes in numerous stages of their plantation career, and discover workers engaged in many different kinds of field labour. In one section, men are busy reaping, and piling the cut canes up by the dam-side, ready to be taken to the mill in punts. In a neighbouring field, we emerge into a tangle of canes, and have to make our way very slowly and warily. An intervening trench strikes us as being an expanse of open country, in contrast with the cane thicket, and it is a pleasant change to jump through the air after a long struggle to tunnel through

a barricade of leaves ; but a second after landing, we are again busy tunnelling with hands and shoulders, the while our feet plod wearily through a thick bed of mud. At intervals we come across an old coolie woman, a pretty coolie lass, or a group of bewitching little coolie children. All the workers in this field are weeding. In the course of traversing this section we chance upon the black "driver," who is in charge of the gang.

The next field is an open expanse of stubble ; here the canes have all been reaped, but the ground is in the clutches of their massed roots, or "stools." Labourers have begun to clear this space ready for planting, and you see many hands busy ploughing with shovel and fork. And in a near neighbouring field a mighty fire is at work, devouring the trash, thus making ready for the reapers.

Heading for the main navigation trench, we pick up our little houseboat some distance ahead of where we left her, and proceed to travel on among the cane-lands to our journey's end. Sun-lovers though we be, we are now grateful for the shelter and shadow of the hut amidships, and we are so tired that its sugar-bag carpeted floor and sugar-bag cushioned seats seem to be the height of luxury. We close our eyes and indulge in day-dreaming. We are wandering through a picture-gallery of life, in which every scene that is presented to us has a double power of appeal. Each memory-painted canvas shows us fascinating Orientals, draped in picturesque native costume, apparently playing at work on an arena which is luxuriantly bedecked with stately and graceful sugar-canes ; and, at the same time, these pictures make us feel the

atmosphere is charged with Western enterprise and activity.

So vivid are the impressions made by life in the Demerara cane-fields, that it is impossible to imagine time can ever fade them, or distance rob them of one iota of their enchantment.

CHAPTER X

A VISIT TO A DEMERARA SUGAR FACTORY

WE are going to visit the largest sugar factory in Demerara, an establishment that is not only distinguished for its size and output, but for its up-to-date machinery and methods. The sugar estate of which it forms such a vital part is known as "Diamond," and embraces many estates that have now been grouped under one management. Plantation Diamond, the most extensive sugar estate in Demerara, covers a vast area on the east bank of the Demerara River, on the outskirts of Georgetown. Factory Diamond is situated about an hour's drive distant from the city.

The way to the factory is along a road teeming with picturesque scenes, and occupying the foreground of a magnificent display of tropical vegetation. True, the whole spectacle is arrayed on a dead level arena; but flat country hath its charms, as everyone knows who has visited Holland or the Norfolk Broads, and the mudlands of Demerara that have been transformed into sugar-cane land can hold their own with any flat lands in the matter of fascination.

For a long stretch the road threads its way through an avenue of palms, aloft on whose giant, branchless trunks are plumelike houghs that nod gracefully in the breeze. Here it is flanked by a canal, which is entirely covered by a thick carpet, that has a groundwork of green, richly bedecked with a raised pattern of cerise-hued Lotus-lilies. A little farther on is another canal, with an equally thick carpet, but this time the design is wrought by delicately tinted, lavender water-hyacinths. And all the while, in the background, are waving fields of sugar-cane, spreading around and across to the remote horizon. In some parts this same scene is displayed on both sides of the road, but at intervals on the river-side the land narrows and becomes a scrub patch intersected by canals, with kokers or sluice-gates, which play an important part in the drainage system of the cane-fields. At intervals, too, the view of the sugar-cane display is partially blocked by *logies*, rows of labourers' dwellings that front the canals; and sometimes it is wholly blotted out by a foreground of market gardens, planted with cocoa-nut trees, plantains, and numerous other tropical fruits and vegetables.

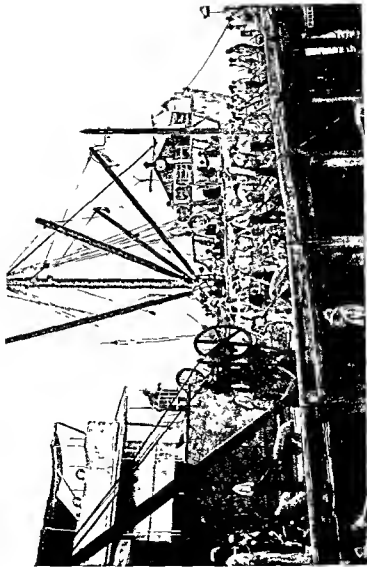
Again, there are roadside scenes of daily life which temporarily draw our attention from the cane-fields. We are constantly meeting and passing some of the coolies and coloured folk, who comprise the labouring population of the estates, or an enterprising John Chinaman who has made a prosperous business concern of his little shanty of a store in the vicinity of the plantations. We see women squatting alongside a trench, washing clothes by the novel method of beating them with hats; a wedding-party of East

Indians driving in a cab, the bride closely veiled, the bridegroom crowned with a pagoda-like erection in bamboo and cardboard, hedecked with tinsel streamers and coloured paper rosettes; darkies balancing on their heads small, medium-sized, or enormous burdens of all descriptions, according to their accustomed method of carrying anything and everything; odd figures playing shop on the ground, seated beneath an old umbrella beside a tray of fairings.

But in spite of these many distractions, the predominant cane-fields ultimately succeed in winning our undivided attention. They are the great spectacle, everything else gradually assumes its rightful position as part of the *mise en scène*. As far as the eye can see—and it has a wide range of vision over this level country—they clothe the landscape. Where the canes, with their numerous streamer-leaves, flank an intersecting trench, they look tall; indeed, we can see that if we stood amongst the tallest of them they would tower above our heads. But taken all together, the cane-fields are dwarfed by the gaunt factory-shafts, which here and there dart very high up into the air.

To-day, there is smoke belching from those chimneys; and around us are many other evidences of a busy harvest season, such as we noticed during our trip aback. For instance, over yonder a field is ablaze, and we know that the flames are preparing it for the reapers; in many of the near-at-hand fields we can see bands of reapers wielding their cutlasses.

And here is a new and very clear witness to the present prevailing interest in Demerara sugar-land. Along the canal, running parallel to the road we are traversing to the mill, comes a train of cane-laden punts, towed by a



JOYAL MAIL STEAM TACKEE COMPANY AND DILLI LINE JOINT CAPO SERVICE STIFFING CANE SUGAR. AT
SANDEACH, ILLINOIS AND CO'S WHARF, GEORGETOWN. See p. 4

mule. To-day, throughout the whole sugar-producing region of the Colony, canes are being cut, transported to the mills, and ground with the utmost speed; for when the harvest season, or, as it is more usually called, the grinding season, begins, everything must be done as quickly as possible, because freshly cut canes give the best sugar-juice. There are two grinding seasons in British Guiana—one in May and one in October.

The pleasure of arriving at our destination is tinged with regret that the journey has come to an end. But just now there is barely a second in which to think of the past, for the present is brimming with delights.

In a spacious room, which occupies the entire first-floor of a country mansion that is balanced aloft on piles, we are made very welcome by the manager and his family. But we are not allowed to go over to the mill just yet. Surely we must be tired after that long drive in the sun—and thirsty and hungry, too. Yes, here we find ourselves once more happy strangers in the midst of friends. Thoroughly refreshed, we are sent across to the factory buildings in charge of an overseer. Our guide is most stimulatingly enthusiastic; he is heart and soul in his work, and not only has he a mind for the commercial side of sugar-making, but an artistic eye that spots the picturesque features in the life of his business. Almost at once we feel sure that he will not insist on giving us a dry-as-dust lesson, but that he will put us in possession of facts in a way that tends to show the romance of a great industry.

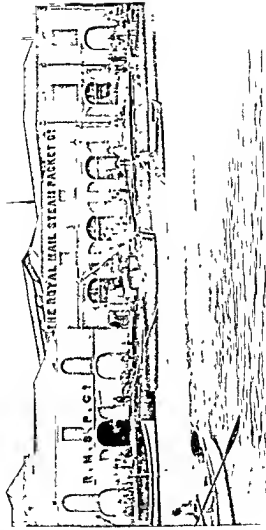
CHAPTER XI

A VISIT TO A DEMERARA SUGAR FACTORY—*continued*

TAKING us to the imposing-looking building which is called the mill, our guide starts at the initial process to show us the whole business of sugar-making. We stand outdoors, fronting a vast trough that is fitted, left and right, with long, wide, gruesome-looking rakes. This trough is situated in the mill-dock, and is fed from punts on each side; but as the double-feeding action consists of precisely similar left-hand and right-hand manœuvres, we concentrate our attention on the near tactics. A cane-laden punt has been towed alongside the trough. This punt is fitted with a network of chains, slung underneath the canes; to effect the unloading, long, overhead chains are now attached to the sling-bed; there is a mysterious roar of machinery; and in a twinkling our astonished eyes behold the whole three-ton load of canes rising hoddily from the punt into the air. For a moment we see them resting securely in a sling, the next moment the whole load looks as if it were going to turn turtle, the next it falls into place on the trough platform. The cane-rakes are lowered, and begin their work of gathering in fresh supplies wherewith to feed the mill, while the empty sling falls back into the punt with a fierce clatter of chains.

The canes are raked down from the platform into a carrier, practically a sliding staircase, which takes them up to the mill-rollers to meet their doom.

We walk up a sloping platform, which follows the route of the carrier, climb some steps, and reach an



A BUSY WHARF AT THE CHIEF PORT OF ENGLAND. See p. 22

upper storey of the factory, where we can see the canes being crushed. They pass through four sets of rollers, for this is a mill designed to squeeze out practically every drop of their juice. The juice extracted by each crushing falls through a copper strainer, and is all conducted through channels, via a pipe, into one tank. Another sliding staircase carries away the mangled remains of the canes, known as megass, which will burn and give a great heat. Hence megass is a valuable economic asset ; it furnishes practically all the fuel for the motive power of a sugar factory. Megass has other uses, of which more anon, for at present our interest is wholly claimed by another economic triumph achieved by this very modern mill which we are visiting. It has a labour-saving device for feeding the furnace ; in course of transit, part of the megass is thrown off down a slide to keep the fire going, and there is a contrivance by which the supply can be increased, diminished, or completely shut off. The surplus is mechanically shot into a storage siding.

We now go down to the ground-floor and watch the cane-juice, fresh from the rollers, running into the collecting tank ready for its second stage of evolution. For clarification purposes it is pumped into iron tanks, and mixed with a certain amount of lime. It is then pumped through steam-heated vessels and raised to boiling-point, or higher.

Further to follow this stage in sugar-manufacture we have to climb up various flights of steps. As we begin the ascent we cling to the handrailing—of course it is sticky, that was only to be expected if we had stopped to think, and there is really no necessity to hold on, for the steps are very firm and not particu-

larly steep. But what a shock that sticky touch gave us for the moment! The whole factory is so clean, so very spick and span, that it was a surprise to get that hint of the nature of the material on which the machines are working. Now we begin to appreciate the immense amount of care that must be exercised in keeping all the surroundings, everything connected with sugar-making, in such a wholesome condition.

When a halt is called, we are standing on a platform amidst large tanks that resemble goods trucks. The juice is pumped into these tanks, where it is allowed to subside for a short time. When the impurities have sunk to the bottom of the tanks, the clear juice is conducted to a series of evaporators called "triple effects," to be concentrated until it attains the consistency of a thick syrup.

This syrup is then drawn into vacuum pans, and evaporated until crystals form. Whilst the crystals are incubating, constant tests are made of the condition of the boiling. The manner of conducting these tests recalls pleasant reminiscences of toffee-making. But the pan-boiler does not use a cup of cold water, and enjoy himself by indulging in tasting experiments. To note the gradual growth of the crystals, he exposes a small quantity of the boiling on an ordinary piece of glass, and there is a look of great anxiety in his eyes as he examines the specimen substance of his pan. The pan-boiler, a native operator, holds a most responsible position; a trifle too little or a trifle too much boiling, and the contents of his pan are spoiled—moreover, his reputation, very likely an excellent one of long standing, has gone for ever.

When the crystals are sufficiently formed, the con-

tents of the pan are discharged into a tank below. The substance at this stage is known as "masse-cuite," and consists of crystals mixed up with a syrupy residue called "molasses." The compound is a sticky, dark-coloured mass, which does not bear the slightest trace of resemblance to golden, Demerara sugar. Yet in a few seconds, by a simple operation, it is transformed into familiar aspect.

All that remains to be done is to separate the crystals from the molasses. For this purpose the masse-cuite is discharged into centrifugals, circular receptacles that have a network lining of very fine mesh. Herein it is whirled round at lightning speed, with the result that the liquid part of the mass is forced through the meshes, and the crystals are left high and dry. In a golden shower they tumble out into a conveyer, which runs them up to the store, ready for packing and shipment.

The sugar leaves the store via a chute, dropped from the upper floor to the ground-floor. A weighing-machine stands beneath its lower mouth, which can be opened and shut, as desired, by a slide. Empty sacks take their turn on the weighing-machine, and as each one gets its fill of 250 pounds it is removed and securely fastened. With little or no delay, the bulging sugar-bags are sent to Georgetown, whence they are taken in cargo-boats to the world's markets.

Factory Diamond, one of the finest sugar factories in British Guiana, employs some 200 hands to make and manipulate its enormous output of about 17,000 tons of sugar a year. Roughly speaking, half the factory operatives are coolies; the other half, coloured natives of the Colony. Most of the labourers are adult

males, but the various gangs include some women and a few children, who perform numerous light duties, keep the buildings clean, and take part in the manufacture of by-products of sugar-cane.

The two chief by-products manufactured at a sugar-mill are molascuit and rum.

Molascuit, used for cattle-food, is a mixture of molasses and sifted megass; that is to say, a compound of the residue of *masse-cuite* and the fine "dust" of the residue of crushed cane.

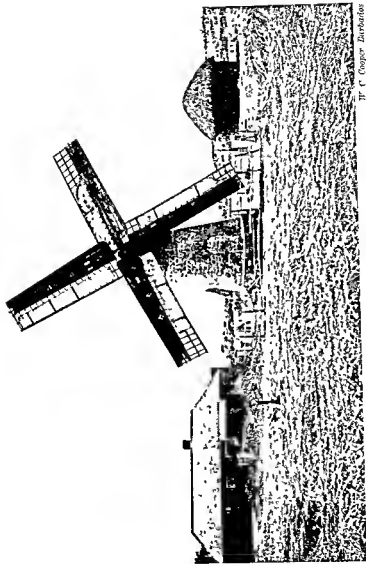
The process of rum-making begins with a mixture locally known as "wash," in which molasses and water are the main ingredients. The wash is run into big vats, and allowed to ferment. After fermentation, it is passed through stills, and through the successive mediums of evaporation and condensation it becomes rum.

CHAPTER XII

MERRYMAKING ON A DEMERARA SUGAR ESTATE

Nowhere can you witness more quaintly attractive entertainments than those which take place in Demerara sugar-land, on high days, holidays, and sundry other special occasions.

Every Saturday brings a time of rejoicing; for it is the weekly festival of Pay-Day, and all the labourers have a half-holiday to celebrate the occasion. At noon, they go home, doff their working-clothes, and don their Sunday-best raiment. Think of them all men, women and children, as dressing themselves up



Mr C. Cooper Barbados

WINDMILL SUGAR WORKS AT BARBADOS, BRITISH WEST INDIES. See p. 42

to take part in a Pageant, in which East and West will vie with each other for your good opinion as to which contributes the more engaging feature to the spectacle.

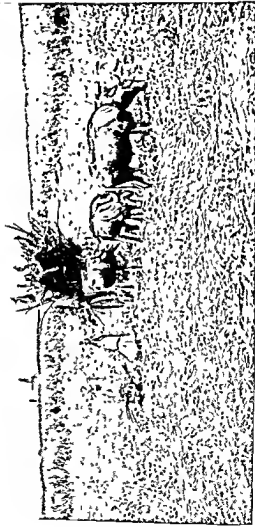
The finest scene is presented when the actors, coming in family groups from all directions, join forces on the tow-path, and stream in a dense crowd along the last section of the route to the pay-office, alongside the mill. *En masse*, that crowd makes you think of a festival procession wending its way through an Oriental fairyland ; coolies predominate in actual numbers, and Western costumes are sombred into insignificance by their Eastern robes, beadgear and jewels, which flash before your eyes in a gorgeous medley of scarlet, blue, green, saffron, magenta and gold, freely interspersed with patches of white and cream to throw into still bolder relief the naturally vivid colours.

Around the pay-office the Pageant breaks up into groups. Now you can see the darkies to better advantage. Most of them present quite a smart appearance in their best clothes ; but the majority follow one detail of fashion which strikes you as very quaint. Accustomed as you have grown to seeing them without shoes and stockings, you now look upon their bare feet as a strange, new sight. Bare feet going about their business in company with oddments of workaday garments are not remarkably incongruous. But bare feet beneath frilly petticoats and an elaborate frock, bare feet protruding from the trousers of a highly respectable suit—such a combination of primitive custom and civilized fashion naturally strikes you as somewhat odd. Some of the women tie up their beads in a red cotton kerchief, and then perch on the

top thereof a large, fancy straw hat, bedecked *à la mode* with ribbons and flowers.

The labourers are called in gangs to the pay-wicket. Whilst waiting their turn, they rest in the shade, whiling away the time according to their fancy. Here you see an old coolie woman leaning against a wall, enjoying a pipe. Near by, a mother is buying a bun for her pickaninny, from an old granny who is hawking round a basket of "dainties." One very little girl is sitting by herself under the shade of a very big gamp, sucking a piece of sugar-cane ; she can hardly be more than eight years old, yet her name is on the pay-sheet for a very good week's work in the fields. On the canal bank lies some timber ; every length of wood is being made to do duty as a garden-seat. All around, men and women are doing nothing, and doing it in a most picturesque style ; and dotted about the ground in their midst are infants and tiny tots. But most of the children in the scene are playing about in the punts, in which they have not long ago come back from work ; the favourite pastime is the perilous game of walking round the edge of the hoats.

After drawing their wages, the labourers, big and little, all go off to the market. An estate's market-place is situated by the roadside ; the scene it presents on a Saturday afternoon is very animated and uniquely picturesque. The goods are displayed on either side of the highway, which is more like a country lane than a road ; nearly every stock-in-trade is spread on the ground—sometimes on a cloth, more often on the grass. A few things are piled up in baskets, or on little trays reared on folding stands. The salesmen and saleswomen, blacks, coolies and Chinese, generally disport



OXFORD CONVEYING SUGAR CANES FROM FIELD TO MILL, I ABERDON SCOTLAND

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themselves on Mother Earth, kneeling, squatting, sitting cross-legged, crouching with knees drawn up to chin, or lounging in the near neighbourhood of their wares; here and there, an odd figure is perched on a dwarf stool.

Act 302

Eatables are very prominent among the goods for sale. One ground-stall is set out with an assortment of vegetables; you are quite excited when you recognize the familiar potato amongst piles of strange-looking roots, tubers, pods, and fruits of the cucumber and marrow family, which boast such queer names as bolinjays, tanniers, eddoes and squash. A small expanse of neighbouring grass exhibits a very pretty display of green and red pepper-pods—called “pimento,” and their neighbours on the other side are some giant hands of bananas and plantains. Next comes a rival attraction to food—an exhibition of clothes and finery; ranged along the ground in piles are cinnamon and cream-coloured tunics for the coolie men, best plush juilas and everyday cotton juilas for the coolie women, striped prints beloved by the darkies, and neat little heaps of brilliant-hued silk scarves hobnobbing with bundles of merino pants and vests. On the opposite side of the way is another stretch of food-supplies—piles of unhusked rice, known as “paddy,” baskets of monkey-nuts, trays of gaudy sweetmeat fairings, and so on to another stack of clothing.

The highway is thronged with folk who have come to make a merry festival of marketing, and again you are struck with the decorative effect produced by the costumes of the masses. The traders, too, have nearly all donned holiday garments, and resemble their customers in appearance; but now and again you espy an

absurdly comical figure, that reminds you of a cheap-Jack who has been at pains to make himself a sight not to be overlooked. For instance, can you possibly help noticing yonder darkie shrimp-seller, in tattered tweed trousers, a holey singlet, and a battered top-hat with a red cord tied round for band ?

One of the chief festivals celebrated on every sugar estate which employs coolie labour is the Taja. In British Guiana, all the labourers take part in the Taja, blacks joining the coolies in the ceremony and its attendant merrymaking. The festival is usually held in February, but the exact date varies on the different estates, so that the hands from one can go over and join those on another, thus insuring an extended round of gaiety.

The Taja is a festival in commemoration of two Mussulman saints, Hassein and Hussein, who were killed in a long-ago big battle, in which they distinguished themselves by mighty deeds of valour. A spot is selected and designated, for the time being, as the tomb of the prophets. The earth of this sacred spot is beaten hard and smooth. Then there is built a structure which is called the Taja, it is a magnificent erection of bamboo, cardboard and paper, from twenty to thirty feet high. In the bamboo framework of this pagoda-like tower huge cardboard boxes are placed one above the other, each box above the ground-storey fitting into the one below, the successive storeys are surrounded by galleries. All the corners are decorated with coloured, pasteboard balls, and the whole erection is profusely ornamented with tinsel and festoons of coloured paper, and surmounted with the figure of a cock.

Each village on an estate builds its own Taja, which is ceremoniously placed on a selected tomb of the prophets, on the first day of the festival, a Saturday. On Monday, the Tajas are carried round from village to village to be compared and admired, then, with the best one leading, a procession is formed. Finally, each group takes its Taja to the estate's wharf—called the "stelling"—where, after it has been rifled for tokens, it is thrown into the sea.

Another Showtime is the Last Day of Grinding. On this occasion, the mule-boys decorate their mules with flowers, and the mill-hands bedeck the machinery with bouquets and garlands. And floral adornments can well be lavish and luxurious in a land where our most carefully-nursed hothouse exhibits are common garden blooms, where orchids, *Victoria Regia* water-lilies, and brilliant-flowering creepers grow in wild profusion.

CHAPTER XIII

HOW DEMERARA SUGAR LEAVES HOME

DEMERARA sugar is sent down from the estates to Georgetown, the distributing port, in sacks, which are always spoken of as "bags." The bags nearly all do this part of the journey by water, but some travel by train. At Georgetown, they may have a short rest in the storage quarters of the wharves, but very often they are taken straight on board the big steamers which transport the hulk of the Colony's annual sugar-supply to the world's markets. Of late, a large proportion of that supply has been going to Canada, owing

to the high price which the Sister Colony has been willing to give for Demerara crystals ; but the Mother Country has kept her name on the list of customers, and I am sure all of you are hoping that she may always do so.

The boats used for the local transport trade are of three kinds : the lighter ; the plebeian punt, which has to be impelled by those formidable-looking oars known as "sweeps" ; and the aristocratic punt, which glides majestically along under canvas.

The transport boats offer many attractions from the picturesque standpoint. The barbaric taste of the wherryman the wide world over is displayed in gaily painted details, such as orange and red rudders, scarlet and blue water-harrels. The costumes of the darkie crews are often a combination of quaint oddments, that cannot be outrivalled by the most fascinating fancy-dress of the Italian peasant, or the merriest rags of the Spanish heggar.

But amongst all the alluring charms of the sugar-boats, I think you will agree with me that, through the medium of a fantastic, labour-saving device which has been invented by the wherry-men, the rowing-punts have been endowed with the supreme power of amusement. To "sweep" these boats down to the harbour with the tide is a comparatively easy task, but the upstream, return journey to the estates, even though the cargo has been discharged, calls for very hard work if manual labour be the motive power. Moreover, jealousy arising from the sailor-man's natural pride in his own boat has inspired the crews of the rowing-punts with a desire to make their craft as efficient as the sailing-punts. Hence, the sweeper-crews, when

going back for a fresh load of sugar, set up a rough mast, and rig it with a patchwork sail made of empty sugar-bags. The Demerara River is the highway for a motley collection of strange-looking boats—Indian canoes, corials and woodskins; timber-rafts, equipped with romantic-looking, palm-thatched camps, which persuade you at a glance that they are manned by relatives of Robinson Crusoe. But amidst all the quaint shipping, most striking are the punts under sugar-bag canvas; they look like a cross between a Norfolk wherry and a Chinese junk.

On arrival at Georgetown, the sugar-bags are discharged in mid-stream into small boats, which transfer them to the warehouses or straight to out-going steamers; or the lighters and punts bring them directly alongside the wharves.

It often happens that whilst sugar-bags are being unloaded at one side of a wharf, there is a big, ocean-going steamer lying at the front thereof, taking aboard a large consignment of Demerara crystals for transport to one of the world's leading markets. Since this is the time above all others to see life in full swing on a Demerara wharf, I am going to take you to one of the largest of the Georgetown wharves, in the height of the sugar-transport season, on a day when it is the centre of both unloading and loading activities.

A large proportion of Demerara sugar leaves home on board the fleet of the Royal Mail Steam Packet Company and Direct Line Joint Cargo Service. These boats discharge a mixed cargo of imports, and take in place an export load of sugar, at three of the busiest among the many busy wharves in Georgetown, each steamer belonging to this fleet being berthed at which-

ever of the three has available accommodation when she comes into harbour. To-day our destination is the extensive wharf belonging to Messrs. Sandbach, Parker and Co, by whose courtesy I am going to take you to see the impressive and amusing scenes amidst which a Royal Mail and Direct Line cargo-steamer is shipping a load of sugar.

CHAPTER XIV

HOW DEMERARA SUGAR LEAVES HOME--*continued*

STANDING at the entrance to a large warehouse, you are confronted by massive stacks of hulging sugar-bags, *that stretch far away into the beyond, and reach from the floor almost to the roof.*

A broad gangway leads across the building to the main door, where you have paused to take a first glance around, at intervals, narrow passages intersect the wall-like piles lengthways, and transversely. Here and there you notice that a sugar-bag wall on one side of a gangway is lower than its opposite neighbour, and you single out spots amidst the neatly towering masses where a rough-and-tumble little heap of sugar-bags suggests the ruins of an erstwhile solid wall. These breaks in the stacks have been made by the removal of sugar-bags for embarkation

Walk a few yards along the broad gangway, so that you can get a more detailed view of your surroundings; but stand well back out of harm's way, for even into this, the quietest of the passages, a heavily laden truck may come whizzing round a corner at any moment,

trundled by a darkie who is putting his back into his work with a zest that will not allow him to pull up at a second's warning. The while you linger here, the more conscious you become of the immensity of the bulk, the vastness of the weight of sugar that is stored in this building. Your sense of smell detects a most pleasing odour that pervades the atmosphere, presently you recognize this fragrance as being akin to the essence of freshly made toffee. You watch a near-at-hand gang of darkies standing aloft on the sugar-hags, throwing them down one at a time to a group of hoys waiting helow with hand-trucks.

Each hoy loads his truck with one hag, and makes off with it down the siding. As the last boy disappears, the men settle down to enjoy a few seconds' rest. Now is the time for you to make your way to the front of the warehouse; step into the siding down which the train of hoys you have just been watching has disappeared, but press ahead warily, so as not to fall foul of any empty trucks on their return journey.

You emerge from the warehouse on to a long and wide platform at the river's edge; in front of you lies the big steamer which is shipping a load of sugar for export; to your left is a lighter unloading sugar, with several lighters and punts waiting in the background for their turn to discharge a similar freight.

You are now in the midst of a veritable pandemonium, but you have not come into an atmosphere throbbing with work, as might reasonably be expected. On the contrary, you seem to have strayed into a Bank Holiday crowd of merrymakers, who are enjoying fine sport with a number of trucks and sacks which they have chanced to discover during a riotous mood, when any-

thing that comes to hand can be converted into a medium of fun and frolic.

The outstanding feature of this playground is an obstacle-race, which is run almost ceaselessly throughout the livelong day. There are four goals, the respective hatches at which the sugar-bags are being hoisted aboard the steamer. The competitors can only traverse the narrow gangways through the warehouse in single file. But directly a boy reaches the open platform, he deftly switches his truck to the left or to the right, according to the position of the hatch whither he is bound, then he begins to run as hard as he can to catch up with the boy a few feet ahead. A second later, he is followed by another boy, who chases him, and so on with the whole of the gang who load up in that particular gangway. And to add to the bustle and excitement, there are boys emerging in quick procession from several gangways at one time.

The competitors themselves create the obstacles which block the track. Most of the impedimenta consist of overturned trucks and scattered sugar-bags, which are strewn about the course as the result of numerous accidental or deliberately planned collisions. The boys going towards the hatches, and those returning therefrom, are not bound to keep to opposite sides of the course, everyone is free to dodge in and out, and round about, just as the fancy takes him. And any tactics are fair play in this obstacle-race game. So the youngsters who are slowly trundling empty trucks to the warehouse, where they will eventually get another load and join in another heat for the hatches, do not attempt to make for an out-of-the-way corner when they want to rest and recover breath;



INTERIOR OF A WEST INDIAN SUGAR MILL OF THE MODERNLY PROGRESSIVE TYPE

W. G. Cooper, Engineer

See p. 68

they suddenly come to a standstill in the thick of the fray, and often turn their empty trucks at an angle which is nicely calculated to upset a comrade's loaded one.

The boys get through much more work under these sporting conditions than they would do if they were subjected to a hard-and-fast discipline whereby they had to wheel backwards and forwards so many trucks per hour. So skilfully do they manipulate the trucks, that in nine cases out of ten they reach the hatches without having a spill. Work does not spoil play, and play does not hinder work; a spirit of good-nature prevails; harmless fun is at the bottom of every obstacle-making prank; and fortunately very few of the collisions have anything but a humorous aspect.

At each hatch, the sugar-bags are hoisted up in sets of eight by the "whip," a rope sling worked by a winch. To see them being lowered and packed away in their travelling-quarters, you must go on board the steamer.

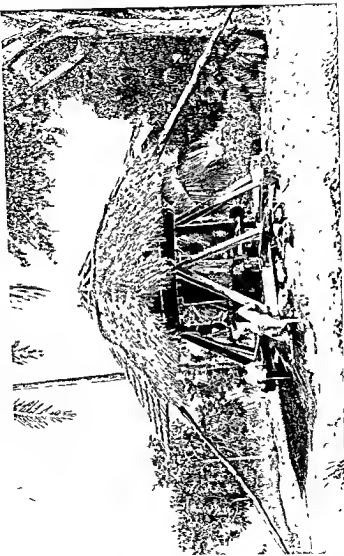
Come below, and take a peep into one division of the ship's capacious hold. Deep down in a yawning chasm, two gangs of men are on duty; they take it in turns to rest and work. The workers let the bags out of the sling, and pack them in neat rows and compact layers. The most popular band amongst these dock-labourers is the water-boy, for heavy packing within the bowels of a ship is a thirsty job. Over and over again the call of "Water-boy" is repeated in more and more urgent tones, until at last a little darkie urchin appears, balancing on his head a pail nearly as big as himself. The little imp is famous for getting "lost" during his numerous daily journeys to

and from the tank, but no one ever manages to catch him having a nap, a romp with the engine-room boys, or a gossip over a dainty morsel with the cook's junior factotum. When an exasperated, thirsty member of the rest-gang does happen to go off in search of him, he is always found leisurely pursuing some stage of his task. And the exasperated one knows better than to insist on more haste if the boy is carrying water; he would certainly consider it his duty, under such provocation, to stumble and drop the pail off his head.

On arriving at the hatch, the water-boy lets down the full bucket at the end of a rope, impatient hands seize it and pass it round as a loving-cup, and within a very few minutes the boy is hauling up an empty bucket.

Upon leaving the steamer, you walk over to the side of the wharf, to watch the lighters and punts being unloaded. The bags are handed up and weighed under the supervision of a licensed weigh-master, the weights duly recorded by him being those accepted by the importers; they are then taken on trucks to the warehouse, where they are stored until their turn comes for leaving home.

At a quarter to six in the evening the order is given to cease work. Trucks are speedily stacked up in the gangways, and all hands muster round the manager's box-office to answer the roll-call. Five minutes later, the day's noisy, merry scene of animation has given place to a peaceful arena, deserted save by the night-watchman, and the piles of sugar-bags that are stacked in the warehouse.



CHAPTER XV

SUGAR-PRODUCTION IN THE BRITISH WEST INDIES

I AM now going to take you to the British West Indies, to have a peep at the cane-sugar industry of the numerous and beautiful islands which are included under that general name for an important part of our Empire. Broadly speaking, all these islands produce sugar, but those playing the most active and prominent part in the industry are Trinidad, Barbados, Jamaica, St. Lucia, Antigua, St. Kitts, and Nevis.

From Georgetown, we can get up amongst these islands in two days, by a Royal Mail steamer. A service of boats, specially built and splendidly equipped for pleasure cruises in tropical seas, gives us the choice of making the round tour of a number of the islands in about a week, spending a short time ashore at each ; or of stopping a few days, until a sister-ship calls on her round, at any we want to explore more thoroughly. It will serve our purpose better to adopt the latter alternative, and in order that you may see as much as possible, in a limited time, of phases of the sugar industry with which you are not already familiar, I am electing to take you to Barbados and Antigua.

On the way up to Barbados, I want to claim your attention for a very brief interval, the while I give you a broad outline of the present-day aspect of the sugar industry in the British West Indian islands as a whole.

These islands have played a very active and highly important part in the regeneration of the cane-sugar industry. To-day, both private enterprise and the

Government—as represented by the Imperial Department of Agriculture—are pursuing a progressive policy in connection with cane-growing and sugar-making. Briefly summarized, this policy may be said to aim at simultaneously decreasing expenditure and increasing production. Foremost among the means taken to realize this end are: experiments in raising seedling canes, and in creating new varieties by cross-fertilization, with a view to discovering the richest and healthiest canes that can be grown under local conditions; the use of artificial manures; the substitution of modern implements of cultivation for the hoe and fork; the provision of facilities for youths to become trained agriculturists; the adoption of modern sugar-making machinery; and the erection of central mills, where sugar can be made on a wholesale scale much more economically than small crops can be converted severally into sugar by old-fashioned methods.

Following immediately on your wanderings in the flat region of Demerara, the gorgeous panorama of the precipitous West Indian islands makes you realize very clearly the universal necessity for a careful study of local conditions in the interests of successful cane cultivation. Here, the cane-lands occupy the plains, dells, and lower slopes of hills amongst serried ranks of mountain-ranges, volcanic piles and peaks. Obviously, there is a natural drainage system, but there are districts in which it must be modified, and the methods employed must vary from those which are suitable to low-lying, flat country. Moreover, the soil is different, and the rainfall differs as regards degree, annual average and season. Specialized study of cane cultivation is particularly necessary in the West Indies,

for local conditions vary considerably in the different islands.

Concerning sugar-making, up to the present you have only seen one variety, Demerara crystals, produced from cane-juice. The West Indian factories turn out numerous kinds :

DEMERARA CRYSTALS—Bright yellow, crystalline sugar, similar to that made in Demerara, after which it is named.

WHITE CRYSTALS.—A crystallized sugar, used for coffee. With this variety, the bleaching process is performed in the factory where the crystals are made. White crystals are now being manufactured in some of the Demerara factories.

GREY CRYSTALS—Made solely for refining.

MUSCOVADO (old-fashioned, soft brown sugar) —
(a) Crude Muscovado, in which the concentrated sugar-juice is put into bags or hogsheads, and the syrup left to drain away from the solid. This sugar is sent to refiners, or to manufacturers of various eatables and drinkables that require sweetening.

(b) Centrifugal Muscovado, the result of separating the solid from the syrup by centrifugal machines. Sugar of this variety is sold for refining or for grocery purposes, according to its colour and to the respective markets' demands.

On arriving at Barbados, I take you straight to a place where you can see the most old-fashioned method of sugar-making *that can now be said to have any connection with the sugar industry*. In justice to this enterprising little island, however, I must assure you that by so doing I am treating it unfairly. True, this Colony has not yet adopted quite such up-to-date

manufacturing methods as some of the neighbouring islands ; nevertheless, it produces Muscovado of a particularly famous quality, and its leading factories are equipped with modern appliances for bringing this branch of the industry up to a high standard of development. But you will be the better able to appreciate the general progress in sugar-production that has been made throughout the British West Indies, by no means excluding Barbados, if I show you first a most old-fashioned mill, and afterwards one of the most up-to-date factories in these Colonies.

CHAPTER XVI

A VISIT TO AN OLD-WORLD SUGAR-MILL

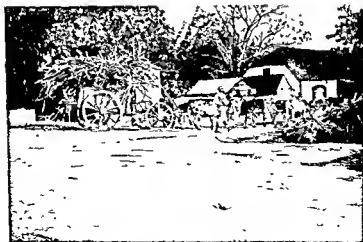
YOU are out in the open country, standing on a little natural platform, round which cane-fields switchback over an undulating plain to the coast on one hand, and billow over low hills on the other. The platform is occupied by a windmill and an unpretentious shed, situated within a stone's-throw of one another, the limited stretch of ground between these buildings affording generous accommodation for little heaps of sugar-cane, and for a few odd-job workfolk. Such a peaceful, dreamy atmosphere hovers about the whole scene—no wonder you look so disbelieving when I tell you that you are in the very heart of a sugar estate, on one of the most strenuous days of its life.

But watch the great arms of the mill ; one minute they are whirling round at racing speed, the next, they are lazily, drowsily lagging on their course, but



"SPIDER MEN" See p 6.

By permission of J H Wilkinson Esq Barbados



EXTERIOR OF A WEST INDIAN SUGAR MILL OF THE MODERATELY PROGRESSIVE TYPE. See p 68

Steam power is used here for cane crushing

all the time they are continuously on the go. And listen to the tunes that are being hummed, whistled and sung by the magic musicians who haunt the sails. Now you have seen signs and heard rumours that helie your first impressions—*this little centre of life is not resting, dreaming, sleeping; on the contrary, it is very wideawake and active.*

To-day is one of the busiest days of the grinding season. Yonder windmill has to crush all the canes grown on the surrounding estate; it can only work at the will of the wind, and to-day there is a strong hreeze blowing. That little shed, which boasts the name of boiling-house, is the factory where all the juice extracted by the mill is made into sugar. The furnaces are fed with megass, but they will only consume dry megass; crushed cane, as it leaves the mill, is "green megass," which contains moisture, and this can only be used directly as fuel in big furnaces, where there is a strong draught. Here, the megass always has to be spread out in the sun to dry; rainy weather cuts short the supply of dry fuel and brings the work of the boiling-house to a standstill. And sugar-juice, as you know, deteriorates if it cannot be extracted and solidified soon after the canes are cut. To-day, the sun is shining and the wind blowing; the mill can work and the fires can be kept going. It is ideal weather for getting the utmost possible amount of work out of a windmill factory, and all hands must co-operate in taking the utmost possible advantage of it. They are certainly doing their share with whole-hearted enthusiasm, but burry and scurry in this old-world centre of activity are wrapped in a mantle of poetic calm.

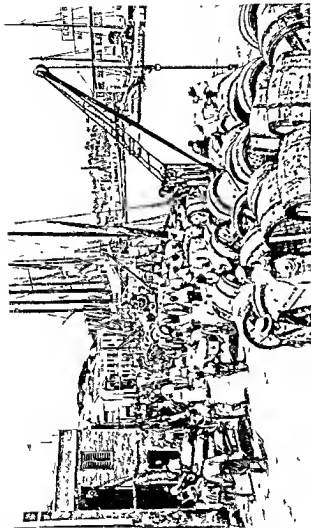
There are fifty-three labourers employed by this estate—in comparison, think of the staff, eight hundred strong, of the small Demerara estate we went over, and of the big Demerara estate which employs over eight thousand labourers.

All the hands here are darkies, for with the exception of Trinidad, which imports East Indian coolie labour, the British West Indian islands rely mainly on the native labouring classes for sugar-estate workers.

This little staff is fulfilling its appointed duties as follows : sixteen are working in the fields, cutting and loading canes ; six are carting ; eleven are stationed at the mill ; four are drying megass ; and sixteen are attached to the boiling-house.

In the West Indies, the canes are reaped with a hatchet, which has a fancy-shaped blade. For transport to the mills, they are loaded on carts, which are drawn by oxen.

So peaceful is the romantic scene which fascinates your gaze, that it takes *some time for you to notice* the various signs of activity which are the vital features thereof. Gradually, however, you become conscious that there are other indications of life besides the whirling of the windmill, and the music which accompanies the merry-go-round of sails. A team of stately oxen is slowly making its way up the hill with a cart-load of canes ; another team is plodding back to the fields with an empty cart. From the general-supply heaps of already unloaded canes, men are collecting little bundles, which they carry on their heads to the mill, a few yards away. Women are spreading out megass to dry in the sun, and raking it over ; other women are carrying dried megass over to the boiling-



11' 12' Cooyer Parbolas

SHIPPING BUSY AT BLINDERTOWN, BALRADOES See 1 11

house, on trays of a litter design, or over to a spot where a surplus of dried fuel is being stacked up in a circular pile, called the "megass heap"

Come across with me to the windmill. In its little round house you find men feeding by hand one set of small rollers. What a tiny stream of juice trickles from these rollers, which are only strong enough to extract less than three-quarters of the sugar-juice from the canes. As memory flashes before your mind's eye a picture of that huge and powerful mill at Factory Diamond in Demerara, with its four sets of gigantic rollers designed to get practically the last drop of juice out of the canes, do you not feel that here you are watching a toy-mill at play?

The juice, as you see, passes through a strainer into a pipe; this pipe conducts it to the boiling-house. Follow me across to that little outhouse, where all the further operations in sugar-making are carried on.

In a modern factory, cane-juice is mysteriously converted into sugar within closed vessels; in this doll's-house factory, every successive change is wrought before your eyes in open cooking utensils, so, to quote the conjurer, "if you watch closely, you can see how it is done."

The juice is first heated to "cracking-point" in the clarifying tank. The combined influence of the furnace beneath and the lime within this tank results in the impurities of the juice rising to the surface of the boiling in a thick scum, which looks like mud. The appearance of cracks in this scum is the sign that the juice is sufficiently clear for concentration. Now it is that the liquid is drawn off by a tap at the bottom of the tank; and, in the interests of economy, any juice

that may be hohnobbing with the impurities is recovered by squeezing the scum through coarse canvas bags, in a hand-worked filter press

The clarified juice is conducted for concentration purposes to the "copper wall"; this consists of a series of big, open pans, known as "tayches," under each of which there is a furnace. The juice is boiled in the first pan until a certain amount of evaporation has taken place, when it is ladled out into the next tayche; here, further evaporation brings the liquid to a denser stage, and again it is ladled out into a neighbouring tayche. The ladling is done by hand, with a "dipper"—a small copper bowl with a very long handle—and the liquid is thus transferred from one tayche to another until it has been brought to the requisite stage of density.

The now treacly mass is next whirled about in an oscillator, which looks like an old-fashioned churn; by this process, the sugar-grains are detached, to some extent, from the liquid

From the oscillator, the mass is poured into large tanks, called "coolers"; here it is left for a few days, after which it is dug out and put into hogshead casks. These hogsheads, which have perforated bottoms, are taken to the stanchion room, which has an open floor of rafters, with tanks beneath; here they are left to drain. It takes about four weeks for the molasses to drip out at the end of which time the contents of the hogsheads consist of dry, powdery grains, or Muscovado sugar. The top of the contents of a cooler is usually taken off separately and drained in sacks

Barhados is one of the very few centres of the industry where such methods are still followed, but year by year the romantic aspect of the landscape is

being modernized by the disappearance of windmills and the appearance in their place of factory shafts, belching forth smoke. From the purely commercial standpoint, Barbados will have to be congratulated when all her old-fashioned factories have been replaced by up-to-date ones; but we as sightseers rejoice that this island still preserves some of the strikingly picturesque relics of the Sugar World in olden days. As sightseers, too, we are particularly interested in the "spider men" of this island. They are to be found in large numbers in the capital, taking hogsheads of sugar and syrup from the warehouses to the wharves on skeleton carts called "spiders." They steer through the most crowded thoroughfares at break-neck speed, and generally seem to regard their occupation as fine sport.

In some parts of the British West Indies, other primitive methods of sugar-making are still practised; but in such cases, the sugar is kept for home use. For instance, there are cattle-mills, driven by oxen, mules, or donkeys, on the principle of the very old-fashioned merry-go-round. And there are places in which the juice is boiled gipsy-fashion, in an iron pot hung from a tripod, over a fire on the ground.

CHAPTER XVII

THE CENTRAL FACTORY SYSTEM

WHEN the British West Indies realized the stern necessity for taking steps to bring their sugar industry up to date, various changes were effected by the owners of estates. All such changes naturally called for an

outlay of capital, and were largely regulated in nature and extent by the amount of money a proprietor was willing and able to invest in improvements. The result as seen at present—the revolution still being in progress—is the distribution throughout the islands of plantations and factories where cultivation methods and sugar-making machinery are nearly all in different stages of evolution. Taking the improvements *en masse*, the outstanding features of the advance movement are :

(1) The adoption of the Louisiana system of cultivation, which favours implemental weeding and ploughing.

(2) The erection of steam crushing-mills. In the case of furnaces which will only consume dry megass, the power is more or less intermittent, according to the available supply of fuel, but any steam mills are much less at the mercy of weather conditions than are windmills.

(3) The adoption of the Santa Cruz factory system, in which the leading advantage is provided by furnaces which will consume green megass, provided the weather conditions are favourable to reaping, such furnaces insure a continuous grinding season.

(4) The use of Aspinall pans. These are steam-heated pans for expediting evaporation, and so facilitating the concentration of cane-juice.

(5) The use of centrifugal machines. These machines separate sugar-grains from molasses in a few seconds, whereas the same work takes many days by the draining process.

The factories at which you find one or more of these improvements, all produce Muscovado sugar. The molasses, or residue syrup, is of superior quality, and a valuable asset. Occasionally, too, the pure cane-juice is not brought up to the crystallization stage, but

is transferred from the copper-wall to the coolers in a semi-concentrated condition, in which it is known as "syrup." There is a very good market for pure syrup, as distinct from molasses.

(6) The institution of the Central Factory System, which has proved so successful in the working that peasant farming is becoming increasingly popular.

Under this system, the cane-farmers in a given district contract to sell their crops direct to a central sugar-making factory. Thus, numerous inferior mills, the upkeep of which was a ruinous drain on their owners' slender profits, have given place to one up-to-date factory. In a word, there has been a division of responsibilities in some of the British West Indian islands—notably Trinidad, St. Lucia, and Antigua—by which the man who now wishes to devote himself to the sugar industry need no longer double the rôles of grower and manufacturer

The first Central Factory erected in these colonies was the Usine St. Madeleine, at Trinidad, founded in 1870, at the instigation of Sir Nevile Lushcock

The Central Factories favour the process of boiling in vacuum, and are noted for their output of "refining crystals."

CHAPTER XVIII

A NIGHT VISIT TO GUNTHORPES CENTRAL FACTORY

I AM now going to take you to the Island of Antigua, the home of Gunthorpes, one of the largest and most enterprising of the recently erected central sugar factories in the British West Indies. There is only

one grinding season in this island—coincident with the one harvest season—from February to June; all the sugar has to be made in those few months from the freshly cut canes, but in those few months the factory can easily deal with all the canes brought to it under contract, and so well is it equipped, and so well managed, that it could cope with a considerably larger supply

By the courtesy of the manager, we have permission to make an expedition to Gunthorpes, the while it is actively engaged in completing its year's grinding within the prescribed limits of five months. Work is in full swing by night as well as by day, and I have asked leave to take you to the scene of operations after dark, as it will be quite a new experience for you to see life in a sugar factory by night

About nine in the evening we set out from St. John's, the capital of Antigua, to drive to our destination, about half an hour distant. Myriads of stars are twinkling overhead, and the moon is shining brightly; not only can we see very plainly that our route is bordered by cane-lands, but we can trace the outline of distant hills, and catch glimpses of a more distant shadowland of mountains. Destitute of mortal habitations, of any sign of mortal life, this peaceful countryside as lit up by the nightlights of the sky seems to us an enchanted land. Suddenly our whole attention is engrossed by one spot in the landscape, where brilliant illuminations display a vast building in a wide frame of light, and thrust the beyond into an inky darkness. In a little time our eyes become accustomed to the contrast between the blaze of electric light and the soft glow of moon and stars, and we can again discern

details of our immediate surroundings. We are now driving along a road that is bordered by dignified-looking wooden houses; these are the headquarters of the manager, chief engineer, overseers, and chemist at the Gunthorpes Factory. At the manager's house we alight, and are welcomed by its hospitable host and hostess, under whose escort we walk over towards the goal of our expedition.

Passing through wide entrance gates, we find ourselves in the extensive grounds known as the mill-yard. We approach the works through an avenue of palms, which threads its way through a garden beautiful. In tones of warmest enthusiasm, the manager tells us about the capabilities, the possibilities of the works, their excellent sanitary arrangements, their well-devised accommodation for the workpeople, and he constantly goes off at a tangent into an equally enthusiastic sketch of plans for making the site still more pleasing to the eye; the more we hear about Gunthorpes, the more we see of it, the more strongly we are convinced that it is justly entitled to rank as a Model Factory.

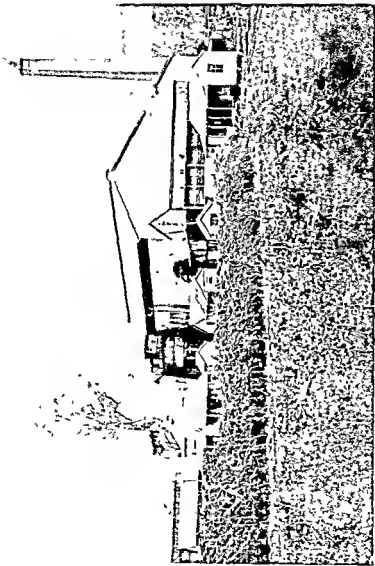
We are taken first to the office, the gallery of which commands a wide view of the mill-yard. Facing us is the actual factory, and all around sweeps a busy railway station. What a rival collection of lights reveals the scene—there is electric light streaming through the factory windows in company with the scorching glow of red-hot furnaces; there is electric light flashing through the mill-yard from gigantic lamps; there are signal lights and sentinel lights along the railway line, gradually being dwarfed and dimmed by distance until they look like tiny fireflies in the

darkness, and overhead countless stars are blinking and winking and twinkling in the moon-hatbed vault.

A cane-laden train is just coming into the station. One great siding is crowded with cane-laden trucks—they look like four-legged tables turned topsy-turvy on trolleys, and piled up with golden sheaves. Another big siding is crowded with empty trucks, which are waiting until the morning to be coupled up to an engine, and taken to fetch more sugar-cane. The railway line, which extends for about six miles up country, was built by Gunthorpes, and is used solely for cane traffic between the contracting estates and the factory.

We walk across the mill-yard to the discharge platform, alongside the cane carrier. Here we find a staff of eight men, working under the directions of the "Cane Carrier Boss." Two trucks at a time are unloaded; three men stand in each, throwing canes down to the carrier, and as they fall higgledy-piggledy therein, two of the gang arrange them a little more conveniently for safe transit to the rollers. The carrier works on the "sliding staircase" principle, and is capable of bearing a load of twelve tons.

On entering the spacious factory, we are immediately struck by the highly picturesque effect of the brilliant light playing on the faces of the darkie workpeople. As we follow our leader through the building, we soon begin to realize that the Gunthorpes method of making cane-juice into sugar is practically the same as that which we saw at Factory Diamond, Demerara. But whereas Diamond makes yellow crystals for the consumer, Gunthorpes turns out grey crystals for the refiner; the difference is accounted for at the clarifica-



ELIA CENTRAL MILL, QUENNJAND. SEE P 17

tion stage of the juice, the processes of bleaching and purification not having to be carried out so thoroughly for refining crystals as for Demerara crystals.

The outstanding difference in the treatment of cane-juice which distinguishes all Crystal-sugar factories from Muscovado works, is the method of doing all the boiling in vacuum instead of by steam.

A few comparative statistics will help you to realize the enormous economic importance of modern sugar-making machinery, such as that with which this central factory is equipped.

The Gunthorpes Mill can grind 450 tons of cane in a day—a windmill has done a good day's work if it crushes 30 tons.

Gunthorpes can make 1 ton of sugar from about 9 tons of cane—in Muscovado works, from 12 to 17 tons of cane are generally represented by a ton of sugar.

CHAPTER XIX

A PEEP AT RIVAL CANE-LANDS

You will remember that the object of our whole expedition was merely to get a peep at the Sugar World. But to do the scantest justice to a widespread industry, I must point out that, so far, I have only taken you to a few of the Imperial British lands where cane-sugar is produced. And although the British Dominions play a very active and important part in the pursuit of this particular branch of sugar-production, you must be made clearly to understand and fully to realize that many foreign countries are our much-to-be-

honoured rivals in the development of sugar-cane growing and cane-sugar making.

With a view to helping you to form some idea of the enterprise of our competitors, I want you to glance through a list which will, I think, enable you to conjure up a fairly comprehensive picture of the Sugar World.

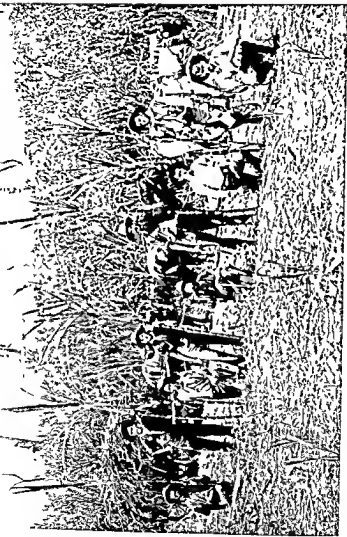
I. THE CHIEF CANE-SUGAR-PRODUCING COUNTRIES.

(a) *In the British Empire.*

British India	..	..	.	..	}	Asia.
Penang, Straits Settlements	..	..		
Mauritius	..	..	..	..	}	Africa.
Natal	..	..	..	..
British West Indies: Jamaica, Trinidad, Barbados, Antigua, St. Kitts, Nevis, St. Lucia					}	America.
British Guiana, South America						
Queensland	..	..	..	..	}	Australia, and Pacific.
Fiji Islands	..	..	..	..

(b) *In Non-British Dominions.*

Spain	Europe.	
Java (<i>Dutch East Indies</i>)	}	Asia.	
Formosa (<i>Japanese possession</i>)							
Philippine Islands (<i>United States control</i>)							
Egypt	}	Africa.
Portuguese East Africa	..	.		..	..
R��union Island (<i>French possession</i>)					..		
Louisiana and Texas (<i>United States</i>)					..	}	North America.
Porto Rico (<i>United States territory</i>)					..		
Cuba (<i>Republic</i>)	}	West Indies.
French West Indies: Martinique and Guadeloupe	..	..	..	..	..
Danish West Indies: St. Croix	..						
Santo Domingo, and Ha��ti (<i>Republics</i>)	..						
Mexico (<i>Republic</i>)	..	..	..	..	..



WHITE CANE CUTTERS, QUEENSLAND Sept '17

Guatemala (Republic)	} Central America.
Salvador ( " )	..	.	..
Nicaragua (")		.	..	
Costa Rica (")		.	..	
Dutch Guiana	} South America.
Venezuela (Republic)	.		..	
Peru (")		..	.	
Argentina (")		.	..	
Brazil ( " )	..	..	..
Hawai, i.e., Sandwich Islands (United States territory)	} Pacific.

II. THE CHIEF BEET-SUGAR-PRODUCING COUNTRIES

Germany	} Europe.
Austria-Hungary	.	.		
Russia	.	.	.	
France	..	.	.
Belgium	.	.	.	
Holland	.	.	.	
Italy	.	.	.	
Sweden	.	.	.	
Spain	..			
Denmark	.		.	
Roumania		.	.	
Servia	.	.	.	
Switzerland	.	.	.	
Bulgaria	.		.	
Greece			.	
United States	.		..	North America.

The total cane-sugar crops of the world for the year 1909-10 amounted to 7,820,000 tons. Included in these figures is the crop of British India, which, being all consumed locally, is not available for the general market. Statistics of this crop are very difficult to obtain : 2,000,000 tons is a rough estimate thereof.

The present beet-sugar crop is about 6,500,000 tons. Over 2,000,000 tons are contributed by Germany,

while Austria-Hungary and Russia each contribute over 1,000,000 tons

In the East, the largest and most important of the foreign cane-sugar crops is produced by the island of Java. Here cane cultivation is most zealously pursued on scientific lines. Reaping is begun in May, and prior to the cutting of the canes a harvest festival is celebrated with much ceremony. Java has long been famous for producing raw sugar of the very best quality; and at the present time it is gaining a considerable reputation for white sugar, particularly in our Indian markets.

Among Western cane-lands, Cuba is predominant. Indeed, this island is supreme among the cane-sugar producing countries of the world, although Java, as leader in the East, runs Cuba very close for the world's championship. Both islands annually produce about 1,000,000 tons of cane-sugar. British India is the only other centre of the cane-sugar industry which can boast a crop yielding sugar by the million tons; but she is very behindhand in her methods of cultivation and manufacture.

The cane-sugar producing centres which are fast pushing their way to the fore in the East and in the West respectively are Hawau (the Sandwich Islands) and Porto Rico.

Sugar-cane was first grown in Australia in 1823, by New South Wales. Some twenty years later Queensland began cultivating sugar-cane, and it was this Colony's enterprise which created an Australian sugar industry. Queensland has always been the supreme, generally the sole, source of supply, and to-day the term

"Australian sugar" is commonly understood to mean Queensland sugar.

In its initial stage, the Queensland sugar industry was developed on the plantation system, whereby a wealthy capitalist is planter, mill-owner, and manufacturer. This system worked satisfactorily until about 1884; then, following on a boom in the Colony as a sugar-growing country, came a period of depression, and in 1885 the industry seemed to be on the verge of annihilation.

At this juncture the Legislative Assembly voted a large sum to be lent for the purpose of establishing central mills. Two mills were experimentally worked on the new system, with such successful results that in 1893 an Act was passed with a view to encouraging the development of the Central Factory System. Under this Act, a number of farmers could combine to form a co-operative company, and obtain capital to erect and equip a central mill by mortgaging their canelands to the Government. The agreement made over such mills to the companies as their own property upon repayment of the Government loan.

The "White Labour" movement threatened more than to counterbalance the beneficial effects of the new system, according to the sugar-producers' criticism of the popular agitation against the employment of Kanaka labour from the South Sea Islands. However, soon after the inauguration of the Commonwealth, the Federal Government passed an Act banishing black labour from Australia. But about the same time a duty was levied on foreign cane-sugar produced by coloured labour, as an offset to the higher wages which Australian sugar-planters had to offer to obtain white labourers.

With State-aided central factories, moderate-sized estates, white labour, and preferential treatment in the Commonwealth markets, the Queensland sugar industry has grown and prospered.

CHAPTER XX

A VISIT TO A BEET-SUGAR FACTORY

It is November, and the Continental beet-sugar-making season is at its height.

The factory for which we are bound is in Belgium. A train from Brussels quickly takes us out into the country, and within an hour we are among fields and farms. We alight at a station which has a spacious siding occupied by beetroot-laden trucks, and as we make our way to our destination, ten minutes' walk distant, we are every moment meeting or passing beetroot-laden carts.

The factory whither we are bound is worked on the "central" system. At the beginning of the planting season, it enters into an agreement with a number of farmers around; the latter undertake to put such and such an acreage under beet cultivation, and the factory, which supplies its co-operators with the best selected seeds, binds itself to buy the crops. Naturally, there are certain stipulations for the protection of both contracting parties.

The roots are taken from farms to factory in barges, via canals; and overland by train and waggon. We will make our way first to the factory yard and watch the unloading operations.

Waggon after waggon, arriving from the farms, comes into the yard and discharges its load; and carts



MOUNTAIN OF SUGAR-BEETROOTS BEING WASHED DOWN CANALS INTO
FACTORY. See p 89

Photo by E. Fussell Taylor J.P., Chairman, Beet Sugar Founders Ltd, Liverpool

drawn by horses, or oxen, or by a horse and an ox in double harness, bring hither the roots that have travelled by train to a near-by station. For a few minutes we watch the beet being thrown up into heaps ; then we pass along a narrow path, hedged in by great walls of neatly piled-up roots.

We emerge on to the side-walk of a canal. A barge is discharging its cargo of beet. In the stern, a mother is crooning to her baby, preparing a meal the while ; and it is quite evident that she has already done a good day's work, for a clothes-line propped up over the whole length of the boat is festooned with a variety of drying garments. In the bow stands a painted barrel, surrounded by a medley of mops, pails, shovels, and cans. The barge's capacious middle is still three-parts full of beetroots ; in their midst are eight men, working in gangs of four. Each man is armed with one of those specially designed forks having ball-ended prongs, such as I told you were used in the fields. The roots are scooped up on the forks and thrown into a chute on the canal bank ; through a small opening they tumble, with a splash, into a gutter, along which they float to the factory. Sometimes the men unload facing the chute, but at intervals they turn their backs thereto, and throw the roots over their shoulders. And if the factory is too busy to deal with the contents of all the barges as they arrive, the beets are transferred to the yard in baskets. But beet-sugar factories work day and night to turn the whole crop into sugar before the frost comes.

We now walk over to the factory and watch the scenes that are being enacted immediately without the building. The loading of pulp—the remains of

beet from which the sugar-juice has been extracted—makes a most attractive picture. The great, snowy-white heaps of refuse look as if they were made up of boiled turnips. Judging from its appearance, you would say the pulp is quite dry, but, as a matter of fact, it contains about 90 per cent. of water. It is very good for cattle food, and is sent back to the farms to serve this purpose. Another very interesting performance to be seen outside the factory is the arrival of the beetroots for immediate use within. They are borne along a gutter by a stream of rather dirty-looking water, beetroots being too heavy to float on absolutely clean water. Their special entrance into the building is a breach in the basement wall; this can be blocked by a grille when no more roots are wanted within for the present.

We now go into the factory, to see what happens to the beet that have been admitted. We find that immediately on entering they are caught up in the compartments of an enormous wheel. They are going to be thoroughly washed. The wheel revolves, and the compartments, in turn, shoot out their contents into a trough.

The cleaned beet are mechanically transferred to an elevator, which consists of a number of iron boxes, slung ladder-wise between chains. The elevator hoists them up to a floor above, where they are weighed, after which a carrier takes them to the cutting-machine. This machine, which is fitted with a gruesome-looking, revolving plate of knives, severs them into shreds.

By means of a revolving shoot, the shreds of beet are supplied, as required, to the diffusion machine below on the ground-floor. I have already explained to you the diffusion process of extracting sugar-juice,

which is carried on within the cylindrical vessels of this huge turn-table.

After the beetroot-juice has been extracted, the various processes of sugar-making in this factory are carried out by up-to-date machinery in practically the same way as at Factory Diamond, and at Gunthorpes, or any other modern sugar-making centre. The juice is clarified by an admixture of lime and carbonic acid, passed through filter presses, and concentrated in vacuum pans; and the crystals are separated from the molasses by centrifugals.

The output of this factory consists mainly of white crystals. Decolorization is primarily effected by means of sulphur, when the sugar is in the juice stage, but the crystals are also "blued" in the centrifugals.

Factory-made beet-sugar is whitish in appearance, but it is not, as a rule, on a par with refined sugar; generally speaking, it ranks with raw, brown cane-sugar, and when sold directly for use, mostly goes to manufacturers of jam, marmalade, chocolate, and other commodities that require sweetening. Some of these manufacturers only use refined sugar. But when the factory-made product is not subjected to the refining process, it is necessary in the case of beet-sugar entirely to free it from molasses, because any trace thereof would be made manifest in a disagreeable flavour, whereas it is not so absolutely essential to bleach raw cane-sugar, or, in other words, to remove all suspicion of its even having been in contact with molasses, for sugar-cane molasses has a pleasant taste.

Beet-sugar factories, like modern cane-sugar mills, have facilities for making molasses yield a second supply of sugar.

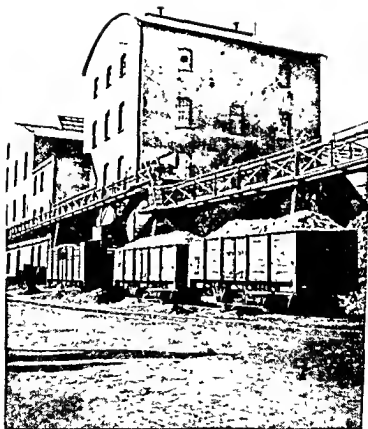
CHAPTER XXI

ROUND AND ABOUT A SUGAR REFINERY

I WANT you clearly to understand the difference between factory-made sugar and refinery-made sugar.

Generally speaking, cane-sugar factories—which we have hitherto spoken of under their more usual name of “mills”—and beet-sugar factories both produce what is known as raw sugar. This product is not impure in the sense that it has been adulterated or contains dirty or harmful ingredients, but in that it retains certain chemical constituents of the juice which are not sugar, as, for instance, colouring matter. Raw sugar goes (a) to brewers, and manufacturers of such commodities as confectionery and condensed milk, and (b) to refiners. But, in addition to their output of raw sugar, many factories make sugar that is very nearly akin to the refined article; for instance, Demerara crystals come so nearly up to the chemical standpoint of purity, that to all intents and purposes they are refined sugar. Again, best quality factory-made Muscovado takes high rank among pure sugars. And in this matter of producing an article that can be sold directly for grocery purposes, cane factories have a decided advantage over beet factories, for, as I have already told you, the foreign ingredients in cane-sugar are agreeable to the nose and palate, whereas those in beet-sugar are productive of a disagreeable taste and smell.

But in order to pass the chemical test of purity, all sugar, no matter whether its origin be the cane or beet, must be refined. This most searching process of purification is capable of converting good quality raw sugar into an article that is absolutely pure sugar to the



AUTOMATIC LOADING OF TRUCKS WITH "PULP" FOR RE DELIVERY TO THE
FARMERS FOR CATTLE FOOD Sep 50

Photo by E Russell Taylor J P Chairman Beet Sugar Founders Ltd Liverpool

extent of 99·95 per cent. ; the remaining 0·05 per cent. is water. You will readily understand, therefore, that in buying her sugar the economical housewife must take into consideration its quality, which is to say, its sweetening capacity, in relation to its price.

There are some large and important refineries situated in the midst of sugar lands ; but others are located in Great Britain, which at present can hardly be said to come within the confines of the sugar-growing world. Amongst all centres of this branch of the sugar industry, a distinguished position has been won by the Sugar Refineries of Messrs. Henry Tate and Sons, Ltd., in London and Liverpool.

By courtesy of the proprietors, we are now going to have a peep at their world-renowned Silvertown Refinery, on the Thames.

We will first make our way to the Wharf, whither comes raw sugar from every Continent of the Globe. It matters not whether this raw sugar is made from cane-juice or beet-juice, whether it arrives in the form of Muscovado, or of refining crystals that are grey, yellow, or white ; so long as it all comes up to sample, it is received at this great central factory and turned into refined sugar ere it leaves the premises. Standing on the Wharf, we watch powerful hydraulic cranes hoisting bags of raw sugar from barges and swinging them into a warehouse at the top of the high factory. Other barges are being loaded with boxes of refined sugar, each package bearing the well-known and honoured trade-mark of "TATE" framed in a diamond. And among the numerous scenes of activity on this Wharf, there is one other that is of outstanding interest ; whilst the sugar-bags are being hauled aloft, coals are

being mechanically unloaded from railway trucks and barges, and carried mechanically to the furnaces via underground passages.

We pass into the Factory, and climb up and up to the top-floor, where at length we find ourselves in the receiving depôt for raw sugar. As the cranes deposit the bags at the entrance, a gang of factory hands unloads the slings at lightning speed; and with equal rapidity the bags are passed into the warehouse, sampled, and weighed. You notice that the warehouse floor, inlaid with large iron plates, looks like a chess-board on an enormous scale; these plates cover openings into the floor beneath, which is occupied by capacious bins. When the raw sugar has been weighed and sampled, you see it shot through one or other of these openings, into the storage quarters below; in the bottom of the bins are holes, through which the sugar can be let down into the melting-pots as it is required for refining.

For refining purposes, raw sugar is converted into a syrup; that is, it is dissolved in water. But there are certain impurities which will not melt, so the next business is to remove these by filtering the liquor through cotton cloth. And next, the filtered solution is passed through animal charcoal, which completes purification by removing the natural colouring matter of the sugar-juice.

You will be specially interested in the "Char-Room" of the Refinery, because it presents sugar-making scenes with which you are unfamiliar. But you will not want to stay there long, for not being suitably attired for the "climate," you will find the atmosphere uncomfortably hot. We descend from

the warehouse into a large room, which has a most funereal aspect. It is fitted with long rows of huge, black cylinders; these are full of animal charcoal, through which soaks the sugar-juice that has already been subjected to the cotton cloth process of filtration. The juice is brown when it enters the char vessels, but white when it leaves them. The white juice is a compound of pure sugar and water.

Now the sugar has to be solidified and the water evaporated. In other words, the juice has to be concentrated. The methods adopted are so similar to those which you have already watched in modern factories, such as Diamond and Gunthorpes, that for some time you feel quite at home in the various quarters of the Refinery which you visit. You recognize the vacuum pans, and know that within them sugar crystals are incubating, you can sympathize with the anxiety of the pan-boiler as he scrutinizes samples of the boiling on a piece of glass, for you realize that with him rests the responsibility of deciding when the *masse-cuite* is ready to leave the pans.

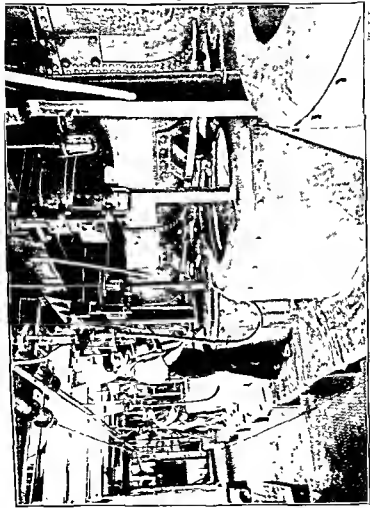
But you are not prepared for the next operation. You expected to see the *masse-cuite* dropped into a big trough, and thence run off into centrifugals; whereas here it is expelled into enormous, barrel-shaped moulds. These moulds have a hollow middle, round which there radiate to the sides a number of vertical plates, enclosing narrow, slab-like spaces. The *masse-cuite* is poured into these spaces, which together contain about ten or eleven hundredweight, and left to cool. Then the moulds are taken by overhead railway to an adjoining room, where each is swung by a crane into a centrifugal, as the won-

drous machine whirls round, you know that the syrup is being driven out, that sugar is being left high and dry. You watch the mould being lifted out of the centrifugal—you see the lid being unscrewed—and you half expect a shower of crystals to issue from the vessel. Instead of which you are confronted by solid, white slabs of sugar, arrayed between the vertical plates. The slabs are taken out and stoved, a process whereby they are hardened under the influence of hot, filtered air.

The centrifugal room has a striking appearance, particularly in contrast with your recent memory-picture of the sombre char-room; the numerous slabs of white sugar hedeck this spacious apartment with most picturesque "snow" scenes.

The slabs are transferred to the cutting-room, where, again, everything is spotlessly clean, and where, again, there is every possible contrivance to guard against the highly purified sugar being touched by hand. The slabs are brought hither on a moving band, but their progress is suddenly arrested by a triangular framework set with knives. The knives cut from above and below, dividing the slabs into strips; a second later other knives, working at right angles to the first ones, divide the strips into the familiar form of cubes. The contents of the frame now fall into a sieve, and take part in a dance, during which dust and uneven lumps are separated from the perfectly cut cubes. The cubes are riddled through into a carrier, and mechanically conveyed to the other side of the room to be packed for transit to all parts of the world.

The packing is practically all done by machinery, and most of the machines work automatically; those which require any manipulation are tended by trim-



W. J. Lee

GROUP OF 1111 CENTRIFUGAL MACHINES AT THE REFINERY OF MRSS. HENRY LALE AND SONS, LIMITED

See p. 8.

looking girls, garbed in scrupulously clean cotton uniform. The cubes are put up in cardboard boxes, which hold specified quantities varying from 1 pound to 14 pounds, or in tins if they are going to the tropics ; and these smaller packages are subsequently fitted in layers within wooden boxes. Or the cubes are packed straight away into hundredweight cases.

But this Refinery's enormous output of sugar does not all leave the works in the form of cubes. Castor, white crystallized, granulated, moist and preserving sugars are all produced here ; indeed, every variety of refined white sugar is made. Some of the cooking sugars consist of broken cubes and the sugar-dust that falls from the slabs during the cutting process. But most of the "loose" varieties are specially treated onwards from the vacuum pan stage. The masse-cuite is only run into moulds for the production of cube sugar ; with other ends in view it is centrifugalled in the free state, and the separated sugar crystals are specially treated according to the kind of sugar that is required. For instance, they are "granulated" in revolving cylinders ; here they are tossed about, and brought into contact with a current of hot filtered air, with the result that they become dry and crisp. They are then passed over sieves to free them from "dust"

Inferior grade sugars are made from the syrup driven off from the superior qualities. And the syrup from which all the crystallizable sugar has been extracted is called molasses, and is turned to profitable account ; it is mixed with a very absorbent variety of moss in the manufacture of Molassine Meal, a popular cattle food.

A peep into the Laboratory, the Box-Making Department, the Electric Power House, the dining-rooms and dressing-rooms of this vast labour centre helps you further to realize what an enormous amount of energy and enterprise have gone to the building up of this great organization.

And now in these last few minutes before we leave the Refinery, these last few minutes which herald the end of our whole expedition, I should like to bring home to you the extent of the great revolution that has been effected since the not-long-ago days when Messrs. Henry Tate and Sons launched refined sugar on the world's markets in the convenient form of cubes. You will remember that I took you to Barbados, in the West Indies, to show you a windmill, in order that you might appreciate the gigantic strides which have been made in the machinery of modern sugar factories. Now, in imagination, come with me again to that island. Here, in one of the hotels, you can see a collection of the moulds in which the old-fashioned sugar-loaves were formed. These copper moulds are kept brightly polished—in graduated sizes they are hung in rows within a framework and used as gongs, and to every visitor they are pointed out as curios, relics of a bygone period which is now ancient history in the sugar industry. Yet less than forty years ago those moulds were serving the purpose for which they were designed, "loaf" sugar was enjoying world-wide popularity, and cube sugar, its famous supplanter—with numerous dice-like and oblong variations of the model—was unknown.

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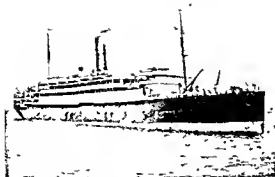
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